Hydraulic Hacker(RFPC) - CD-ROM Authoring - Embedded System Conference

Software Patent Update - Choosing A Trademark - Component Oriented Software

Midnight Engineering

Resources And Insight For The Entrepreneurial Engineer

November/December, 1994
Volume 5, Number 6

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UNREAL Becomes REAL

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ENTCON 1995

April 7,8,and 9
1995
Golden, CO

A realtime version of Midnight Engineering

Magazine for Entrepreneurial Engineers

Reader Service Number 99

eXplore the Opportunities

Create Your Own Automated Systems Using Xplor PDCs and Simple BASIC Programs

Xplor Personal **D**igital **C**ontrollers can propel you into the wide open frontier of computerized control and monitoring with minimal effort and cost. No mere novelty, these "mini-sports" pack surprising power and are loaded with extras that make the journey from idea to working reality fun and rewarding.

Professionals will find Xplor PDCs an efficient, economical way to add simple, yet reliable control capabilities to prototypes or full-scale production runs. Beginners and hobbyists can use PDCs to sharpen their programming skills while developing original concepts. Just identify a need and hit the accelerator – Embedded Control, Simple Robotics, PC Peripherals, Monitoring Systems, Data Logging – Xplor PDCs will take you to the far reaches of your imagination.

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• 80C32 CPU with 12 digital I/O lines
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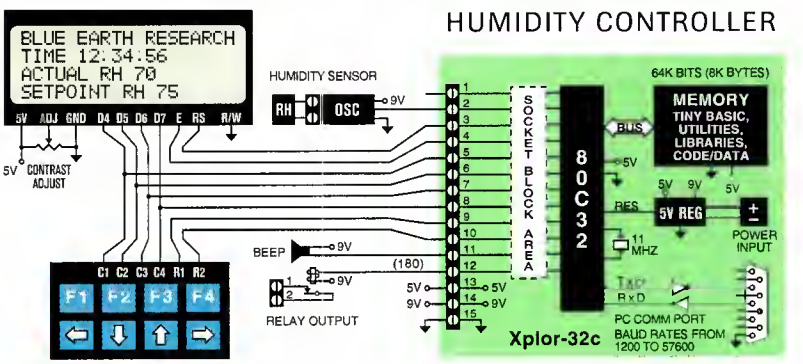
• Screw terminal block and project case.
Also available with 11 channel 10-bit A/D converter – Xplor-32ca

Built-in BASIC Language, Powerful Utilities, and Library Functions Make Programming Easy

The example below shows how easy it is to wire-up and program the Xplor-32c for a simple on/off controller application. The built-in software gives you the power to write programs like this in just minutes. Your program is stored in nonvolatile memory and will automatically execute when power is applied.



ALL YOU NEED IS A PC and a Terminal Program (Or Xplor Starter Package)

No Other Programming Equipment Required!

```
10  CALL 8132                          (LIBRARY FUNC: Initialize LCD)
20  ONTIME 200                         (Initialize 1 second interrupt)
30  PRINT "BLUE EARTH RESEARCH" ;      (Display sign-on message)

40  PRINT  " \\ ACTUAL RH " ; FREQ  0 ;  (Display actual sensor frequency)
50  PRINT " \\\ SETPOINT RH " ; S ;      (Display desired setpoint value)

60  CALL 8140                          (LIBRARY FUNC: Get keypad input)
70  IF DBY 27=6 THEN S=S - 1           (Decrement setpoint if down arrow)
80  IF DBY 27=7 THEN S=S + 1           (Increment setpoint if up arrow)

100 IF FREQ 0<S THEN BIT 180=1         (If actual < setpoint then relay on)
110 IF FREQ 0>S THEN BIT 180=0         (If actual > setpoint then relay off)
120 GOTO 40                            (Loop back to repeat program)

200 PRINT " \TIME " ; DBY 51 ; " : " ;  (This 1 second interrupt routine)
210 PRINT DBY 50; " : " ; DBY 49 ; :IRET  ( refreshes LCD with current time. )
```

Xplor PDCs – MORE CHOICES FOR GREATER FLEXIBILITY

Xplor-32 $59.95

Same features as the 32c less case and terminal block. Board is only 2.15" x 2.2".

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November/December, 1994
Volume 5, Number 6

Midnight Engineering

Resources and Insight For The Entrepreneurial Engineer

About ME ...

ME is dedicated to those individuals interested in creating, developing, producing, and distributing high technology products. The content is meant to address the individual and small enterprise, their entrepreneurial issues and opportunities, and the technology they use now and will use in the near future. The magazine is designed around the concept of "a half-dozen entrepreneurial engineers sitting around having a beer." Topics will range from embedded systems technical details to software and hardware design. A particular issue might cover biotechnology or nanotechnolygy just as well as everyday personal business such as taxes or time management and productivity. Quite simply, ME reflects the exchange of experience, insight, and concerns of today's entrepreneurial engineer.

This magazine was developed, edited, produced, and published by one person — there is no editorial or production staff involved at any time. The contributors are entrepreneurial engineers and their submissions are not intended to set any literary highwater marks.

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Cover: A computer-rendered volume visualization in which a Julia set is rotated 90 degrees. Inset is a physical 3D construction of the mathematically defined shape rendered by Laser Sintering form of Stereolithography. Both images are © 1993 by Stewart Dickson, courtesy of the Williams Gallery (see page 12).

CONTENTS

10 Virtual Camera (Making it Real) — *by Charles Ostman*

17 Why ENTCON? — *by John Gaudio*

21 What Do I Name This Sucker? — *by Rick Martin*

23 Component-Oriented Software — 2 — *by Jack Krupansky*

33 Embedded Product Startup — *by Dennis Stearns*

37 Patent Discussions — 2 — *by Curtis L. Harrington*

40 Pat. Pend. — Patent Office Perspective — *by Donald Kelly*

46 Entrepreneur On The Move — *by Jack Krupansky*

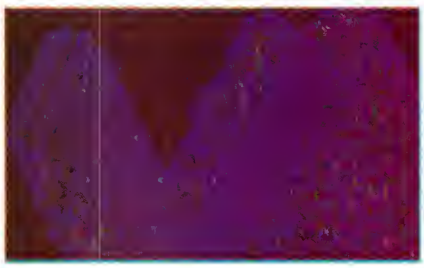
49 Embedded Systems Conference — *by Bruce Boyes*

61 $99 Flutterwumpers — *by Don Lancaster*

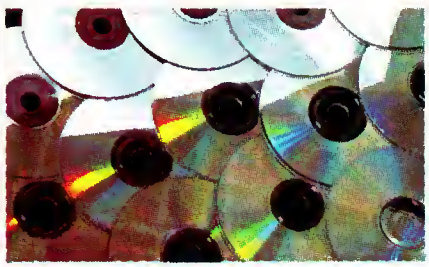
68 CD-ROM Authoring — *by Jim Stone*

75 RFPC — 3 (Hydraulic Hacker) — *by William E. Gates*

8 Editorial
6 Letters To ME
20 Back Issue Information
31 Right Out Of The Box
36 The Bookshelf
78 Advertiser Index



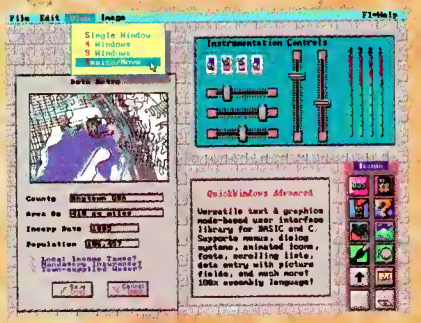
page 10



page 68

page 75

Stuck in a GUI mess? Get QuickWindows!



Other GUIs are fat and slow. Not so with QuickWindows. It's lean, fast, and easy to use!

Dress up your programs with our powerful user interface library. Add windows, pop-up and pull-down menus, SAA dialog boxes with 12 object types, animated icons, fonts, picture field data entry, image display, context-sensitive help, powerful DOS functions, and much more. Mouse support built-in. Over 180 functions. Supports 26 text and graphics modes through Super VGA. 100% assembly language. The smallest library (typically 40k) with a powerful punch. Supports BASIC and C Language. Only $149! ($349 with assembly source code)

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Letters To ME

Midnight Rigging

I have enjoyed your ***Boston Operation*** series. My father was a rigger and hauler and much of what you wrote about was very familiar. Keep up the good work! I'm looking forward to ***Midnight Engineering*** lasting longer than ***MicroCornucopia***.

Thomas Mitchell
Laurel, MD

[MicroC was an eclectic magazine that Dave Thompson built up from a newsletter over a period of 10 years. Apparently Dave let life slip by him during that period and he suddenly woke up to find his children were grown. I may have other problems, but that is one mistake that I have not made. Dave, it's been a long time, where are you? —WEG]

Midnight Video

You mentioned in a recent issue that you were videotaping part of the teardown of the printing equipment. How about putting together a video on your operations? Sort of an "interview" with a tour of projects inwork & completed, and how you layout & design the magazine.

If you put it in your magazine for $20, and offer it for $10 with a 3-year or more renewal, I think you would sell several. Your enthusiasm is contagious. I would enjoy seeing the innovations you have developed to increase your productivity. I have so many projects inwork myself, I don't seem to get the completion rate I would like to. Advice on how to focus on priorities & guide a project through to completion is what I need. I would bet many others have the same problem. Video is particularly easy to absorb, and it might make a good topic for future articles.

You also mentioned you might print/publish for others, as well as your own magazine. A video would be perfect for showing how you prefer layout, croping, separations, etc. for those thinking of submitting materials for printing.

I plan to do a newsletter on the topics of: AI, Expert Systems, Neural Nets, Machine Intelligence, Thinking Machines, Lasers, Nanotechnology, Virtual Reality, Autonomous Vehicles, Space Mining and other subjects that relate to the maturing technologies that have developed around the ideas originally proposed in Science Fiction. I am gathering materials on the above listed subjects: magazine & newspaper articles, video clips aired on cable & satellite, Trade Journals & Publications, and my expanding library of books. I want my newsletter to be a reference work that shows others where & how to find the information on these areas, and most of all, how to apply it. Each issue would have a review on a book or Trade Journal, along with info on how & where to obtain a copy.

I'm shooting for July '95 as the date for the first issue. If you are ready to print by then, I would like to receive information and a bid on my publication

David C. Schweikart
Tucson, AZ

[You and several other folks seem to want to print at RFPC, even though it isn't operating yet. The reason is easy to figure out: Many of us have been paying for printing over the years and are tired of the unrealistic cost, poor service, and delays/excuses that we get most of the time from most printers. I certainly hope to be printing by July '95 and for a fellow Midnight Engineer I think I can beat any bid you can get from a commercial printer. I am really intrigued with personal video production. I am looking for some really powerful, low-cost, desktop video production products and CD-ROM authoring tools. Yes, I'll be doing a video, it's only a matter of time. —WEG]

Page Numbers and email

As a long time reader, I appreciate your magazine. I would like for you (and advertisers and authors) to also list their email addresses when you give

Letters To ME

your phone or fax numbers. You could also use this as an electronics submission method from authors too.

Thanks for staying a non-monthly magazine, that has more meat than fluff. Your mag contents reminds me of *BYTE* when Carl Helmers was in charge in the mid-'70s.

By the way, would it be possible to put page numbers somewhere on pages with ads that go over the normal area for page numbers?

Jack Coats
Houston, TX

[I include email addresses when they are supplied to me. I don't supply my own because I don't have one — that is the subject of a future editorial. Tradition has it that full page advertisers own the page and if you can get them to OK page numbers on their pages, I'll put them on. —WEG]

Fire-fighting Robot Contest

ME readers may be interested to know The Connecticut Robotics Society is again sponsoring its International Robot contest next April, 1995. The contest is open to everyone and has different categories which will enable anyone of any age, ability or experience level to compete and possibly win.

The challenge will be to build a Robotic device that can move through a model of a single floor of a house, look for fire (a lit candle), and then extinguish it. The model house will be eight feet by eight feet with walls, hallways and rooms. Contestants will be given the exact layout of the house with the official rules. The Robot that searches the house, finds the candle, and extinguishes it in the shortest time will win. The Robots must be less than one foot on a side and can be tethered to a personal computer or controlled by a self-contained microprocessor. There will be different judging criteria so that any Robot can be a winner regardless of its simplicity, complexity or sophistication. This all-day international event will be the culmination of months of work and effort by Roboticists of all ages and from all over. Last year's contest generated inquiries from 41 states and foreign countries. The entrants ranged from MIT professors to fourth graders.

All entrants will receive an award and there will be separate special prizes for the winners in each category. For info and rules of the contest contact:

Jake Mendelssohn
Connecticut Robotics Society
190 Mohegan Drive
West Harfford, CT 06117
Voice: 203-233-2379
FAX: 203-232-0435
Prodigy: KJRP71A
Internet: jake.mendelssohn@circellar.com

A Fellow Printer

Please sign me up for a subscription to *Midnight Engineering*. I got a sample issue and really got a kick from the *Boston Operation* articles and look forward to reading about your on-going adventures in the graphic arts.

Plus there's the empathy! I started as a young engineer with R.R. Donnelley & Sons. Equipment projects including rigging and installation of a wide variety of machinery. Like you, I was also known for some non-conventional approaches.

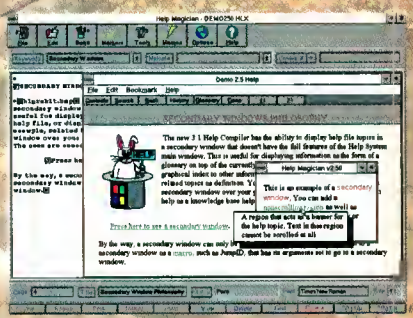
Then I jumped from the largest printer to being one of the smallest. Following a family heritage in typesetting and printing, I have since owned & operated a small, publication printing company for about 20 years. One based on typesetting and evolving into electronic publishing systems. Real-world, hands-on stuff including moving the plant and equipment last year.

Now I mix the technical aspects of digital data input, the aesthetics of layout & typography, and the systems for efficient printing & binding. Or,

continued on page 42

Windows Help Magician 2.5

PC MAGAZINE says "Designing help systems with the Help Magician is so easy that you might even want to use it as a hypertext authoring tool, independent of providing help for a product. Certainly for Windows programmers it's indispensable"! - July 1993 Toolkits section



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Live From Oberlin, KS

Oberlin, Kansas City Administrator, Jerry Fear, has been subscribing to ***Midnight Engineering*** for some time now, trying to figure out how to get some of us high tech entrepreneurs to move to his small town. Jerry introduced me to Mark Bannister at the Docking Institute For Public Affairs centered at Fort Hays State University in Hays, Kansas. Mark, in turn, invited me to speak at the recent Tri-State Economic Development Conference held in Oberlin.

In this small Northwestern Kansas town, they built a huge, beautiful, multi-million dollar Gateway Conference Center including state-of-the-art audio/visual and satellite communications. Gathered here were a couple hundred rural economic development folks from Colorado, Kansas, and Nebraska. I was to address them on the concept of the Rural High Tech Entrepreneur.

What can I tell these people that will help them get guys like me to move to their small rural towns in the heartland of America? I had to tell them the truth: It is going to happen all by itself and it is already started. Despite years of struggling to get industry to move to rural areas, a much more powerful trend is starting that will be bigger than anything they ever hoped for.

Check out this morning's ***Denver Post*** headline: "BOOM", subtitled: "We Wanted It, Now What Do We Do With It?" People are moving from both coasts, but mostly from California. This may well be the start of something really big, driven by the economic and political differences that form America's split personality.

On the one hand, you have the big city power/money centers (like LA, DC, and NYC) and on the other hand you have the bulk of the country's population spread over a vast area in towns less than 100,000 population. Heartland America is becoming more and more polarized with regard to big city politics and big national politics. The people who are moving to the rural areas have more in common with their new neighbors than they had in common with their former big city friends. This will probably further increase and may help catalyze the unrest that is brewing in Middle America over the politics of today.

Perceiving Opportunity In Rural America

When I moved from California in 1988 to Fort Collins, CO (near Denver) I began to see that the real opportunity is in the rural towns and in 1992 I moved to Rocky Ford, CO. As I explained to the folks in Oberlin, nobody came to me in Fort Collins and said: "Bill, you've got to come to Rocky Ford, we've got the answer—*Economic Development*. No, I figured it out for myself. It is finally starting to dawn on Joe Average that something is wrong with the economics and politics of LA, SF, DC, NYC or any other densely populated area in the country.

CNN Doesn't Do Rocky Ford, CO!

Rural America pretty much stays out of the mainstream media focus. But, many of these small towns that have been stagnant or even drying up for 25 years are filling up again with people who bring only what they want with them from the big city. In most cases, the people coming in are not as visible as I am, but the truth is that five years ago Rocky Ford had two FOR SALE signs on every block — now there is none.

The fact is, the economic differential between Los Angeles and Rocky Ford is just about the biggest differential we've seen in America for 50 years. The housing prices alone differ by an order of magnitude. Commercial buildings can offer an even wider differential. For the entrepreneur operating nationwide or worldwide without a storefront, this differential puts money in your pocket. And, when you consider crime, congestion, etc., there is no comparison. Most homeowners in the big city can sell out and buy a house for cash in many of these small rural towns.

"But there are no jobs in Oberlin," you say? You must have missed the recent ***Fortune*** magazine cover story that proclaimed that "JOBS" are history. ***Fortune*** outlined the economy of the 21st century where people will be required to do more, know more, be more flexible, and operate at a higher level of risk and independence with less security. If this doesn't define the entrepreneur, I don't know what does. If this is true, you will begin to see politicians talk more about promoting *business* and less about creating *jobs*.

So, the answer for Oberlin and Rocky Ford and all the other small rural towns of America is: Find the people who can bring their job with them. Many of these folks will grow and prosper and hire. Just find a way to tell these guys that you've got open spaces, less expensive housing and office space, good traditional schools, less crime, and more friendliness. It doesn't hurt to remind them that you have FedEx, UPS, telephone service, cable TV, MacDonald's, Subway sandwich shops, and the latest movies.

It won't be long before we'll see the cover story on ***TIME*** magazine : ***Growth Crisis in Smalltown America!*** Once something like this really gets started — and people decide they want something different out of life — they'll line up to buy into Smalltown, USA just like they lined up to buy into Irvine, CA 20 years ago.

Bill Gates

How many memory management tools does it take to create a program?

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A 286 DOS extender with no runtime royalties!

Now everyone can afford to break the 640Kb DOS barrier! Directly access up to 16 megabytes of extended memory just as if it were conventional memory on any 80286 or above. Run multi-megabyte programs in protected mode in less than 256 Kb of conventional memory, solving low memory problems caused by network shells and other memory hungry TSRs. Boost program performance - all code and data is memory resident so there is no swapping to disk. Blinker 3.0 is fully compatible with the DPMI, VCPI and XMS specifications so your protected mode programs will run under Windows, DESQview™ and OS/2® as well as DOS. And Blinker 3.0 features a completely transparent compiler-independent VM system to access up to 64 Mb of virtual memory.

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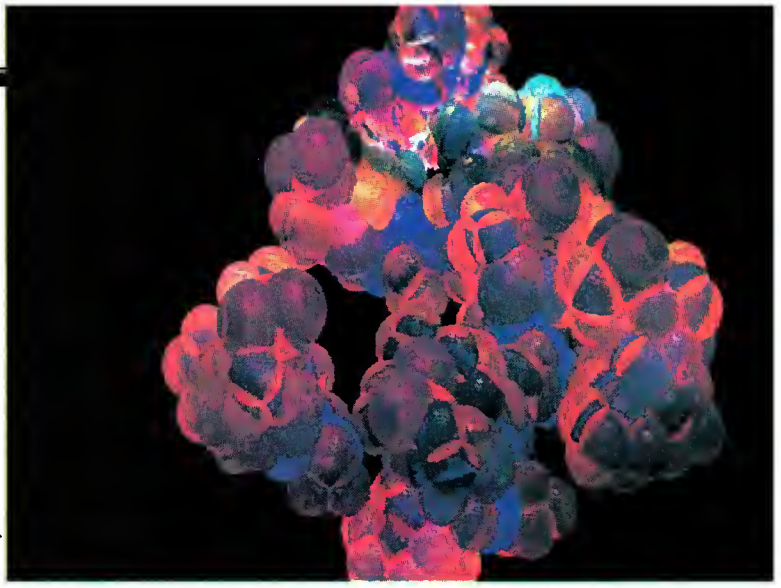
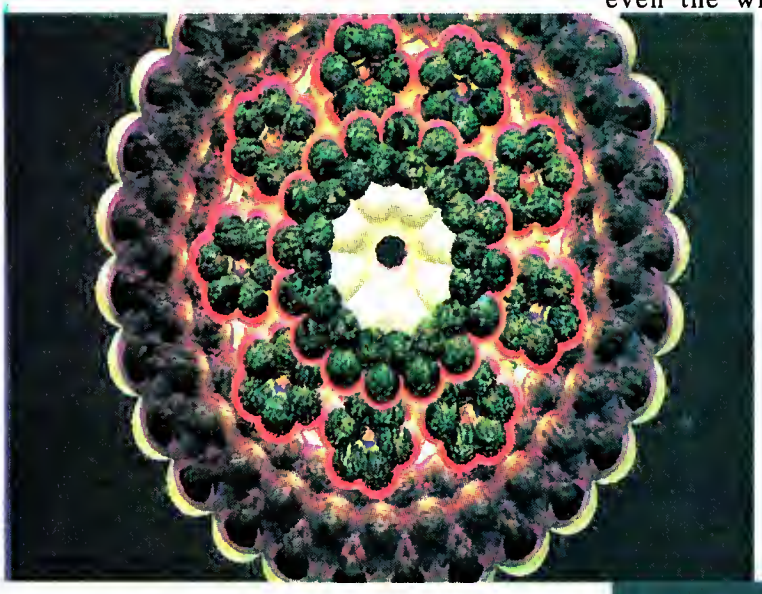
Virtual Camera

by Charles Ostman



CUBANE2—This is an example of a cubane molecular structure, raytraced with a collection of fractal generated reflection maps, as well as refractive indices to generate a colorful, but also functional 3D depiction of this virtual object.

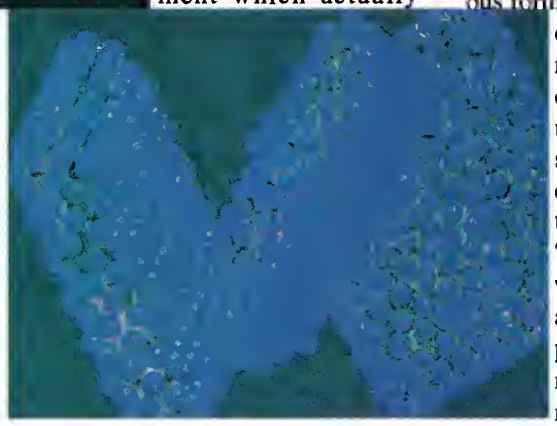
Computer art is a term which can encompass a very diverse range of applications and techniques. For some, it merely translates to using a computer as an electronic replacement for "traditional" drawing or painting. For others, the spectrum is broader, utilizing animation and sound, digitized imagery combined with imagery created by the computer, and so on.



PLANET2—This is a molecular planetary gear, as per one of many such structures theoretically depicted by Eric Drexler, and actually modelled by Ralph Merkle. The resulting data set was then converted to raytracing procedural script, with various "layers" of fractal generated reflection and self-illuminating glow mapping routines applied to provide this somewhat lively view of a nano-mechanical component.

My approach, as both a programmer and an artist, and one who is fascinated with structure, form, and the mechanics of interactive forces as they occur in nature, is to create scenes which are the results of computational models based on those characteristics. Virtually all structures, such as branching structures of trees, the construction of a leaf or flower, distribution patterns of stars in the core of a galaxy, or pebbles on a beach, even the wispy forms of a cloud, are forms which can be defined and replicated with a series of formulae and procedures that represent the features of those structures.

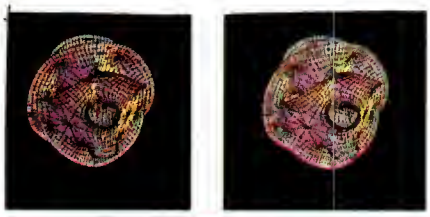
What is more important, however, is that once those processes have been defined, and established as procedural rules, those rules can be "broken." In other words, there is vastly more potential in creating a virtual environment which actually contains the elements of an evolving "organism," than merely "drawing" a static picture. This is the real power of the computer, to be able to create structures and forms, as a process, utilizing interactive forces and influences, as they occur (or don't occur) in nature. Furthermore, surfaces, textures, and patterns can be similarly created, and applied to the structures to create complete virtual "objects" within the virtual universe that resides in the computer's memory.

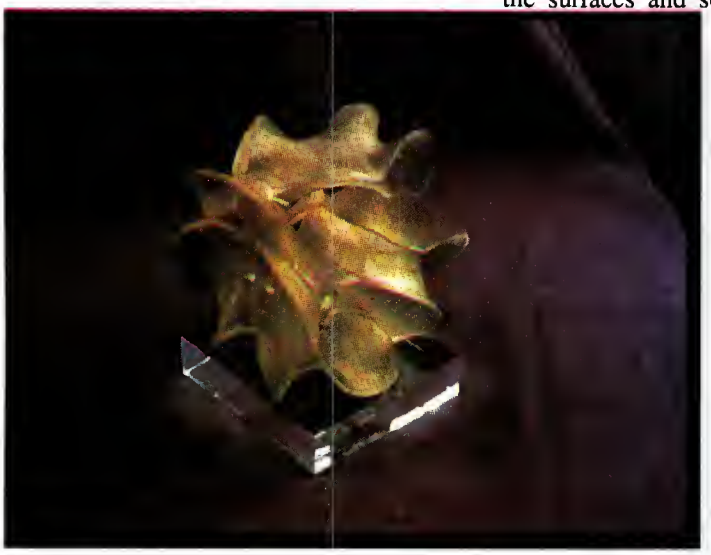


DIAMOND1—These are diamondoid "plateiettes" as depicted via a data model provided by Ralph Merkle. The internal atoms of these structures are suface mapped with a fractal generated carbonlike "metallic" finish, and the outer atoms were assigned the refractive index of diamond (.4132).

The spatial coordinates of these structures are the results of computations based on interactive forces, such as various chaotic events, symmetrical and asymmetrical growth patterns, various forms of fractal geometries, and so on. Also, in some cases, algorithms that mimic the behavior of interactive life forms are used to evolve "unnatural" structural components. The colors and textures applied to these structures were "evolved" in much the same way. The resulting structures and surface textures are then ported into a variety of various rendering applications, and raytraced.

Raytracing is a method of creating three dimensional "scenes" by calculating the interaction of virtual rays of light within a specified three dimensional area. The light rays emanate from virtual light sources which can be placed anywhere within the scene, and these





"lights" can possess special properties to enhance or create an almost infinite variety of lighting effects. Furthermore, the surfaces and solids being illuminated within the scene can possess both reflective and refractive properties. The objects within the scene are therefore illuminated by these lights, and their appearance is affected accordingly.

Unlike "traditional" art, there is no "drawing" of anything, nor are there any physical art tools of any type

Fermat5_cgi (top)
digital image 2048 X 1366 pixel resolution (wide white borders)
Complex Projective Varieties Determined by x^5 + y^5 = Z^5
(Fermat's Last Theorem), n = 5, Stereoscopic Mathematica computer rendering, Harvest Fine Art Print on archival paper, (c) 1990 Andrew Hanson, Stewart Dickson.

(see process below)

The core Mathematica code for the visualization was devised by Andrew Hanson, Indiana University. hanson@iuvax.cs.indiana.edu

The image was rendered by Stewart Dickson using the Wolfram Research, Inc. Mathematica system for doing mathematics by computer on a Silicon Graphics 4D/25TG Personal Iris.

Fermat5_real (above)
digital image 1536 X 1024 pixel resolution
Complex Projective Varieties Determined by x^5 + y^5 = Z^5
(Fermat's Last Theorem), n = 5.
Dimensions: 9.0" X 6.8" X 6.8", Stereolithograph, © 1991 Andrew Hanson, Stewart Dickson.
A superquadric surface in complex variables analogous to Fermat's proof of the n=3 special case.
X = Re[z1k[a,b,n,k1]]
Y = Re[z2k[a,b,n,k2]]
Z = Cos[alpha]*Im[z1k[a,b,n,k1]] + Sin[alpha]*Im[z2k[a,b,n,k2]]
alpha = Pi/4;
z1k = E^(k*2*Pi*I/n)*u1[a,b]^(2.0/n)
z2k = E^(k*2*Pi*I/n)*u2[a,b]^(2.0/n)
u1 = .5 (E^(a + I*b) + E^(- a - I*b))
u2 = .5 (E^(a + I*b) - E^(- a - I*b))
-1.0 <= a <= 1.0; 0 <= b <= Pi/2; 0 <= k1 <= n-1; 0 <= k2 <= n - 1;
The core Mathematica code for the visualization was devised by Andrew Hanson, Indiana University. hanson@iuvax.cs.indiana.edu
The three-dimensional computer database for the surface was adapted for sculpture by Stewart Dickson.
Software/Hardware used:
The Wolfram Research, Inc. Mathematica system for doing mathematics by computer, Silicon Graphics 4D/25TG Personal Iris. Mathematica-Wavefront-Stereolithography data interface by Stewart Dickson. Stereolithography by SLA-500 system at Hughes Aircraft Company, El Segundo, California, funding by the ACM SIGGRAPH Special Projects Committee, T. DeFanti, Chair.

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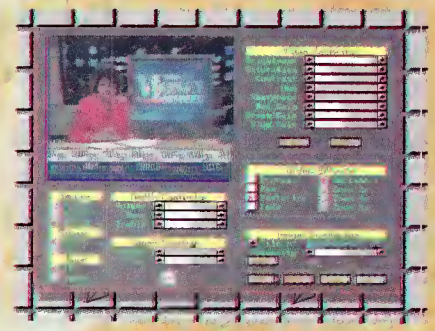

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UNREAL Becomes REAL

(other than a room full of computers). Visitors who drop by my basement lab are sometimes surprised to see nothing that even remotely resembles an "artistic" process. In fact, there is really nothing to see at all. Usually, about the only visible evidence of something artistic going on might be some code listings, or an occasional "test run" which might yield some abbreviated representation of a polygon structure, or a patch of some evolving texture.

However, when all of the elements of a given scene are combined and rendered, the result is an art form completely unique, and specific to the computer as a tool. My quest is to continue to utilize the computer as an artistic research tool, and to explore new methods of structure and texture creation.

Impossibilities

With these tools, "impossible" virtual worlds can be explored, chaotic events that defy the "ordinary" rules of nature can be modeled, as well as the "evolution" of silicon based life forms as they might exist in some alien environment.

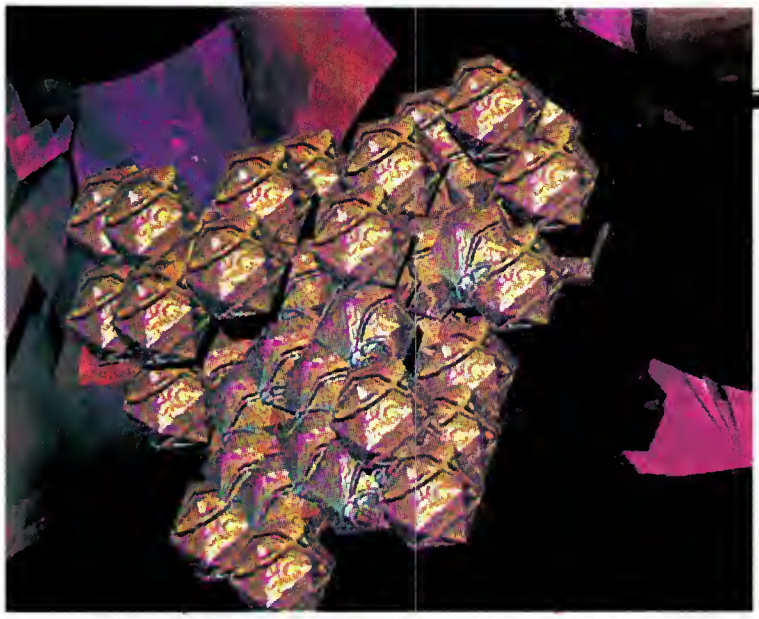
Fermat3_cgl (top) digital image 2048 x 1366 pixel resolution
© 1990 Andrew Hanson, Stewart Dickson. Stereoscopic Mathematica computer rendering, Harvest Fine Art Print on archival paper. Core Mathematica code for the visualization was devised by Andrew Hanson. The image was rendered by Stewart Dickson using Wolfram Research, Inc Mathematica system for doing mathematics by computer on a Silicon Graphics 4D/25TG Personal Iris.

Fermat3_real (above)
digital image 1536 X 1024 pixel resolution
Complex Projective Varieties Determined by x^3 + y^3 = z^3 (Fermat's Last Theorem), n = 3.
Dimensions: 8.5" X 6.0" X 6.0", Stereolithograph, © 1991 Andrew Hanson, Stewart Dickson.
X = Re[z1k[a,b,n,k1]]
Y = Re[z2k[a,b,n,k2]]
Z = Cos[alpha]*Im[z1k[a,b,n,k1]] + Sin[alpha]*Im[z2k[a,b,n,k2]]
alpha = Pi/4;
z1k = E^(k*2*Pi*I/n)*u1[a,b]^(2.0/n)
z2k = E^(k*2*Pi*I/n)*u2[a,b]^(2.0/n)
u1 = .5 (E^(a + I*b) + E^(- a - I*b))
u2 = .5 (E^(a + I*b) - E^(- a - I*b))
-1.0 <= a <= 1.0; 0 <= b <= Pi/2; 0 <= k1 <= n-1; 0 <= k2 <= n - 1;
The core Mathematica code for the visualization was devised by Andrew Hanson,
Indiana University. hanson@iuvax.cs.indiana.edu
The Three-dimensional computer database for the surface was adapted for sculpture by Stewart Dickson.
Software/Hardware used: The Wolfram Research, Inc. Mathematica system for doing mathematics by computer, Silicon Graphics 4D/25TG Personal Iris. Mathematica-Wavefront-Stereolithography data interface by Stewart Dickson. Stereolithography by SLA-500 system at Hughes Aircraft Company, El Segundo, California, funding by the ACM SIGGRAPH Special Projects Committee, T. DeFanti, Chair.

COVER IMAGE:

julia3_cgl
Digital image 1024 x 1024 pixel resolution Computer-rendered volume visualization, after the work of Alan Norton, © 1993 Stewart Dickson courtesy of the Williams Gallery. An oblique view of a 200 x 300 x 200 x 8 bit per pixel volume convergence map of the procedure outlined below. The image is part of a proposed collaboration to construct a physical model of this object via Selective Laser Sintering technology at the Department of Mechanical Engring, University of Texas at Austin. Software/Hardware used: Quaternion Julia Set calculator by Stewart Dickson interfaced to the Army High-Performance Computing Research Center (AHPCRC), University of Minnesota, "Brick of Bytes" (BOB) public-domain volume visualization software on a Silicon Graphics Personal Iris 4D/35TG graphical workstation.

julia3_real (inset)
digital image 1536 X 1024 pixel resolution
Selective laser-sinteredcomputer-rendered volume visualization, after the work of Alan Norton Dimensions: 2" X 4" X 1";
© 1993 Stewart Dickson courtesy of the Williams Gallery.
The physical 3D construction of a 200 x 200 x 200 x 1 bit per pixel volume convergence map of the procedure
Z - e^(I pi/2) Z^2 + e^(-I pi/2) (0.2809,-0.53,0.0,0.0)
in which a set is rotated 90 degrees in the complex plane. Z is a complex quaternion four-vector of the form (a, b I, c j, d k).
The pixel volume represents the three-space spanned by (1, I, j, 0).
Software/Hardware used:
Quaternion Julia Set calculator, data format conversion software by Stewart Dickson, Selective Laser Sintering by the Department of Mechanical Engineering, University of Texas at Austin. Contact: Richard Crawford richc@mcl.cc.utexas.edu.
Documentation on these images and more can be found at URL: http://www.wri.com/~mathart or http://mathart.com or fax:805-371-1214
Prints are available through the Williams Gallery, 8 Chambers Street, Princeton, NJ 08542. (609)921-1142, wmgallery@aol.com



VIRCLST1 — A cluster of selfreplicating, quasi-viral molcular components are lurking about in the cytoplasm of a cell, preparing to perform an eventual alteration of some aspect of the intra-cellur chemistry of the host cell. A series of algorithms were written to construct the geometry of the cluster formation, the fractal generated topology of the cell structure, and surface and bump map textures of the rendered objects.

The computer has a tremendous potential for visualizing, or modelling non-existent, or even "impossible" worlds or environments. My current activities, though increasingly diverse, have in part focussed on creating molecular components and nanotechnology related "nano devices" in virtual space as part of a nanotechnology development project (see previous articles on nanotechnology in the Jan/Feb '94 and May/June '94 issues of ME). Besides being an interesting art form, a more serious application is the actual modelling, and analysis of these molecular components as potential "building blocks" for nanomechanical device construction and interactive mechano-synthesis simulation.

Though much of the software and techniques used in the particular raytracing examples shown with this article are unique custom tools and processes developed by the author, there are many off-the-shelf available rendering packages available for the PC which can produce sufficient 3D visualization results for this type of application. The important feature in this process is not so much the particulars of the picture produced (although I will freely admit to having more than a bit of fun here), but producing the 3D spatial coordinate data, and other related data sets, that are responsible for having generated the image in the first place. The resulting image is only an artifact of the process and the data created. It's the data itself that is the real target goal.

In fact, an extension of this process is to use the same spatial coordinate data to generate polygon mesh, or spline solids data, not only for static image or rendered animation imagery, but also for real time interactive "virtual reality" worlds (see Nov/Dec '93 issue of ME). In an interactive virtual world environment, intelligence, and dynamic features can be attributed to the objects within that world to construct a complete simulation event model.

However, an even more interesting extension of this activity is the creation of "real" objects from "virtual" objects created in cyberspace as a procedural modelling process. This is where the boundary between the real world and virtual world becomes blurred. Prior to this, I have been stressing the concept of creating data sets and dynamic feature attributes, to mimic the behavior of non-existent objects in a virtual world environment.

Though a variety of techniques currently exist for replicating physical objects from 3D polygon mesh data, perhaps no particular process produces more accurate, and highly robust results than stereolithography. In this process, laser light, aimed into a vat of photo-reactive resin via a 3D addressable vector reflector scanning system, is utilized to harden the resin at the spatial coordinates that the laser light is directed towards. Though the process is expensive, and requires a bit of applied expertise on the part of the technical staff operating such a system, the results can produce surprisingly faithful physical renderings of virtual objects.

Stewart Dickson is an excellent example of how this process is applied. He uses this process both to explore complex mathematical forms and shapes, and to produce truly beautiful, aesthetic "art" objects from a virtual environment. I met Stewart at the Nanothinc office (where I spend much of my time these days producing virtual molecular objects and "nanotech" related renderings). I was absolutely amazed at his collection of complex mathematical forms constructed from Mathematica generated data sets, and converted into marvelous physical "art" objects.

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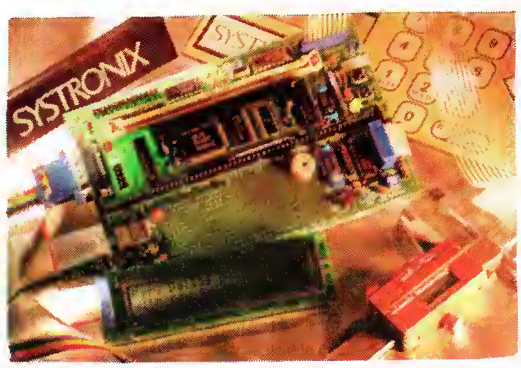

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Indeed, besides his work in the 3D rendering and animation production industry, he also has a business, "Mathart," through which he markets his collection of fine art math sculptures. What is most interesting here, of course, is the concept of being able to utilize this process to create objects that can be physically held and handled by the observer. This allows for more aesthetic appreciation of the object, but perhaps more importantly, it provides a tactile and spatial cognitive interface to the observer for understanding a complex, or non-existent form.

Available computing power and software tools to take advantage of that computing power continues to accelerate at an ever increasing pace. The potential for applying these tools goes way beyond the dry, minimal realms of spreadsheets and text editors. In today's world, almost anything is possible, and in the case of some of the examples of virtual object creation and rendering cited in this article, even the "impossible" is indeed, possible.

The images shown on pages 10 and 13 are from a series of raytraced 3D visualizations of various molecules. The actual XYZ spatial coordinate data of the molecules were provided by various academic research groups who had created molecular modelling software as part of their development work. Though there are a myriad of various molecular data file formats, each being specific to a particular research group or project, an effort was made to create a translation tool which would then provide a scripting protocol compatable with the proprietary raytracing engine developed by the author to create these images.

A variety of procedural texturing and reflection mapping routines were applied, some of which were fractal or chaotic function generated, to produce the unusual visual appearance of the rendered molecules. Also, since this process utilizes "true" raytracing, in which virtual light rays were calculated as they interact with objects with specific physical properties, the "atoms" in the scenes were also assigned refractive index values which were specific (when possible) to the actual ir of the element depicted.

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Charles Ostman has over 20 years working with electronics, computers, and physics, including 8 years at the Lawrence Berkeley Laboratory at the University of California. he may be reached at 510-549-0129 or email at charles000@aol.com

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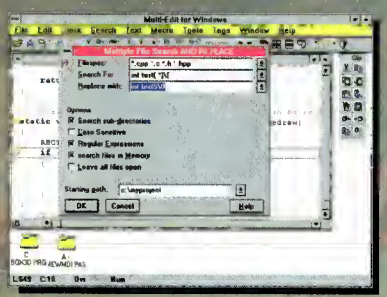

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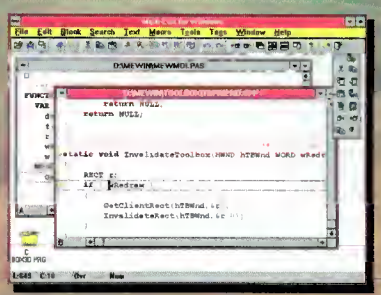

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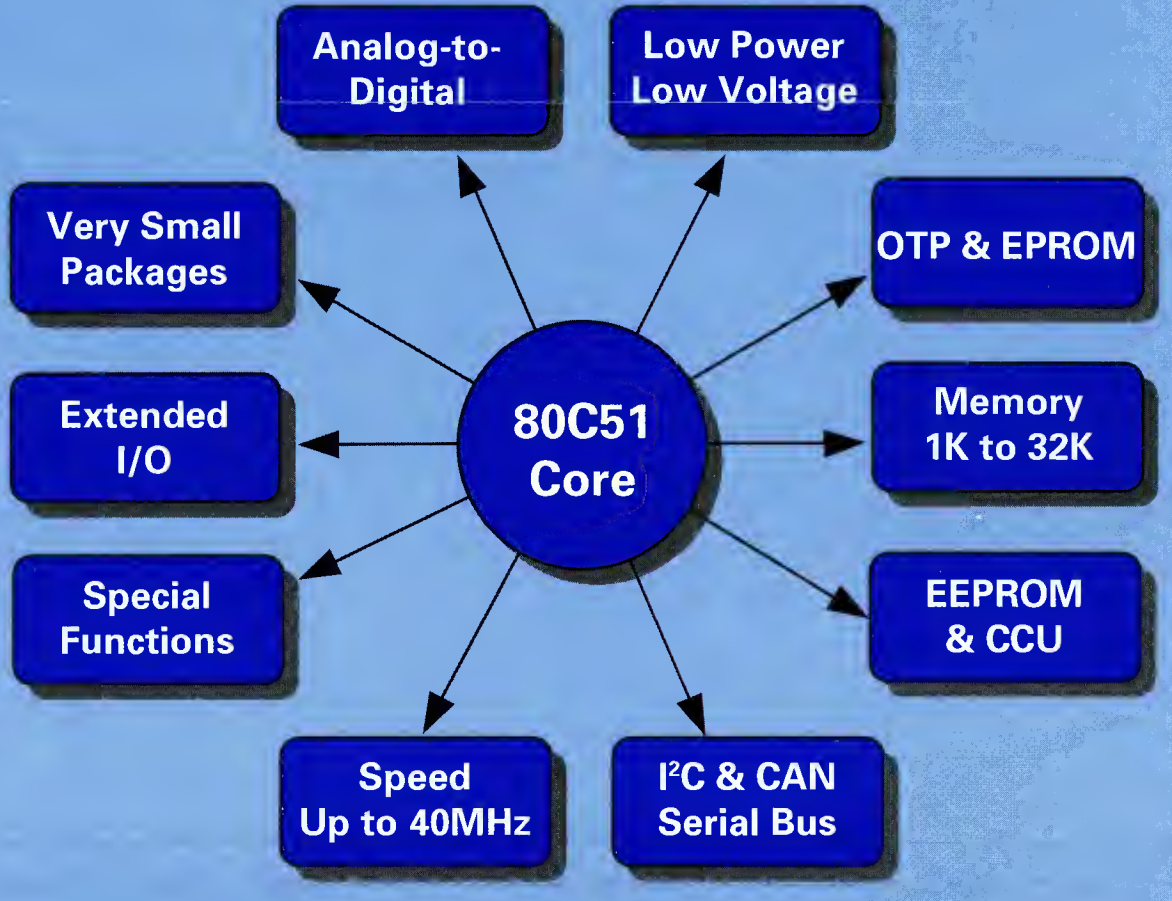

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P	8XC748	(1)	2K	2K	64	16	2+3/8			2			24-Pin Skinny DIP Package and SSOP	A28, F24, N24, OB24
S	8XC751	(1)	2K	2K	64	16	2+3/8		●	1			24-Pin Skinny DIP Package and SSOP	A28, F24, N24, OB24
P	8XC749	(1)	2K	2K	64	16	2+5/8			2	5	8	PWM, and SSOP	A28, DB28, F28, N28
S	8XC752	(1)	2K	2K	64	16	2+5/8		●	1	5	8	PWM, and SSOP	A28, DB28, F28, N28
SC	80C31/8XC51	(2)	4K	4K	128	33	4	●		2			Industry Standard	A44, B44, F40, K44, N40
P	80CL31/80CL51		(3)	4K	128	16	4	●		2			Low Voltage/Power (1.8V to 6V)	N40, D40, B44
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SC	8XC451		4K	4K	128	16	7	● (5)		2			7 I/O Ports, Processor Bus Interface	A68
P	8XC550		4K	4K	128	16	4	●		2+WD	8	8	WD	A44, F40, K44, N40
P	8XC851		—	4K	128	16	4	●		2			256 Bytes EEPROM, 80C51 Pin-Compatible	A44, B44, N40
P	8XC542		4K	4K	256	16	1	● (5)	●	2			8042 Compatible, ACCESS.bus	A44, K44
P	83C852	(1)	—	6K	256	12	2/8			2			Smart Card, 2K EEPRDM, CCU	T28 or die
P	83CL580/80CL580		(3)	6K	256	12	5	●	●	3+WD	8	4	WD, PWM, Low Voltage (2.5V to 6V)	B64, O56
P	80C32/8XC52	(2)	8K	8K	256	24	4	●		3			Industry Standard	A44, B44, F40, K44, N40
PC	8XC652	(3)	8K	8K	256	24	4	●	●	2			16K RDM/EPROM, I²C Serial Bus	A44, B44, F40, K44, N40
S	8XC51FA		8K	8K	256	24	4	● (5)		3+PCA			Industry Standard	A44, B44, F40, K44, N40
S	8XL51FA		8K	8K	256	20	4	● (5)		3+PCA			Low Voltage 8XC51FA (3V) OTP	A44, B44, F40, K44, N40
P	8XC575		8K	8K	256	16	4	● (5)		3+PCA+WD			*See Features 8elow	N40, F40, A44, K44, 844
P	8XC576		8K	8K	256	16	4	● (5)		3+PCA+WD	10	6	*See Features 8elow plus UPI and 10-bit A/D	N40, F40, A44, K44, 844
PC	8XC562		(4)	8K	256	16	6	●		3+WD	8	8	PWM, WD, T2	A68, B80
PC	8XC552	(3)	8K	8K	256	30	6	●	●	3+WD	10	8	PWM, WD, T2	A68, 880, K68
P	83CL267		—	12K	256	8	5+7/8		●(7)	3	4	4	OSD, 9PWM Outputs, 8LED Drivers	B64, R64
P	83CL268		—	12K	256	8	5+7/8		●(7)	3+RCP	4	4	OSD, 8 PWM Outputs, 3 wire Serial I/O	B64, R64
P	8XCD55	(1)	16K	16K	256	20	3+1/2			2			Reduced EMI, OSD, 9 PWM Outputs	NB42
P	8XC54		16K	16K	256	16	4	● (5)		3			Standard 8XC51 Compatible	A44, 844, F40, K44, N40
P	8XC504		16K	16K	256	20	4	● (5)		2			8XC54 with Hardware Oivide	A44, F40, K44, N40, 844
P	8XC654	(3)	16K	16K	256	24	4	●	●	2			16K ROM/EPROM, I²C Serial Bus	A44, 844, F40, K44, N40
P	83CE654		—	16K	256	16	4	●	●	2			83C654 with Reduced EMI	B44
P	83CL781		(3)	16K	256	12	4	●	●	3			Low Voltage/Power (1.8V to 6V)	N40, B44
P	83CL782		(3)	16K	256	12	4	●	●	3			83CL781 optimized for 12MHz @ 3.1V	N40, B44
S	8XC51F8		16K	16K	256	24	4	● (5)		3+PCA			Industry Standard	A44, 844, F40, K44, N40
S	8XL51FB		16K	16K	256	20	4	● (5)		3+PCA			Low Voltage (3V) OTP	A44, 844, F40, K44, N40
P	83CL167		—	16K	256	8	5+7/8		●(7)	3	4	4	OSD, 9 PWM Outputs, 8 LED Drivers	B64, R64
P	83CL168		—	16K	256	8	5+7/8		●(7)	3+RCP	4	4	OSD, 9 PWM Outputs, 8 LED Drivers	B64, R64
P	8XC524		16K	16K	512	20	4	●	●	3+WD			32K ROM/EPROM, 512 RAM, WD	A44, 844, F40, K44, N40
P	8XC592		16K	16K	512	16	6	●		3+WD	10	8	CAN 8us, WD, T2	A68, K68
P	8XC58		32K	32K	256	16	4	● (5)		3			Standard 8XC51 Compatible	A44, 844, F40, K44, N40
S	8XC51FC		32K	32K	256	24	4	● (5)		3+PCA			Industry Standard	A44, 844, F40, K44, N40
P	8XC528		32K	32K	512	20	4	●	●	3+WD			Large memory for high level languages, WD	A44, 844, F40, K44, N40, R42
P	8XCE528		—	32K	512	16	4	●	●	3+WD			Reduced EMI version of 8XC528	A44, 844
P	8XCE598		32K	32K	512	16	6	● (5)		3+WD	10	8	CAN bus, WD, T2, PWM, reduced EMI	B80, Q80
P	8XCE558		32K (6)	32K	1024	16	6	●	●	3+WD	10	8	32K FLASH, WD, PWM, Low EMI	B80

Footnotes

1) No ROM-less derivative available
2) 80C31, 80C32 = ROM-less
   80C51, 80C52 = Masked ROM
   87C51, 87C52 = EPROM/OTP
3) Piggyback available for EPROM development
4) Use 87C552 EPROM/OTP
5) Enhanced UART
6) 32K FLASH EEPROM (MTP)
7) 2 I²C serial ports
8) The EPROM/OTP prefix is S

Abbreviations

A/D = Analog-to-Digital Converter
PWM = Pulse Width Modulation
WD = Watchdog Timer to reset the microcontroller
T2 = Capture/Compare Counter/Timer with High Speed Output
I²C = Inter-Integrated Circuit Serial Communications Bus
OSD = On Screen Display
PCA = Programmable Counter Array
CCU = Cryptographic Calculation Unit (RSA)
EMI = Electro-Magnetic Interference
RCP = Remote Control Preprocessor

Package Types

A = Plastic Leaded Chip Carrier (PLCC)
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Why ENTCON?

by John Gaudio

ENTCON '94 was more than a great experience. It's proven to be an outstanding resource. The afternoon trade show and many of the speakers were great, but for me, the best things to come out of the conference were the contacts I made with other Midnight Engineers.

Matt Trask, and his company Communica, 508-759-6714, are now a part of my own "Virtual Engineering Department," along with Bruce Eckel, 415-331-0288, the man who wrote the book on C++, worked together with me on a proposal to help straighten out problems with the automated baggage system at DIA, (Denver International Airport). J. Gaudio Company consists of Madonna, my bride, Johnnie, our two year old Chairman of the Board, and me. So taking on a project of this magnitude would have been crazy without resources like those available to me through Matt, Bruce, and other Midnight Engineers.

After speaking with Denver's manager of public works, the engi neer in charge of airport construction, and several other key people involved in the project, I put together a team with exper tise in C++, OS/2, RF (Radio Frequency) communication, process control, mechanical systems, computer control systems, network ing, and project management. All but two of my team members came through contacts I made at ENTCON '94. I sent letters and faxes to all the members of the mayor's technical task force, met with people from the company that originally designed the automated baggage system, and even rubbed elbows with a member or two of the city council. So what happened?

Even though no baggage system like this had ever been created, the city and county of Denver chose not to go with experts in the computer control, RF, and C++ areas, but chose instead to hire a German firm that specializes in baggage systems. That firm told Denver that in theory the automated system should work, but they didn't know how long it would take to make it work. They then recommended that Denver hire another baggage handling company and build a manual baggage system to get the airport up and running by the end of February, 1995.

The report I saw didn't really address the nature or extent of the problems with the automated system. It just suggested a very low tech way to get around the problem. The result was a politi cal solution to a technical problem, and today DIA is still an airport without planes, passengers, or a working baggage system.

Would the airport be open now if Denver had chosen my team of Midnight Engineers? We'll never know for sure.

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After The Conference

There's no question though, that I learned a great deal in the process, have lots of new contacts to show for the effort, and would never have been a contender for this project without the resources I found at ENTCON '94.

Since then I've called on some of those resources for help with projects that actually happened. In one case a customer needed a database application developed in thirty days, and distributed to 250 users on both MS-DOS and Macintosh platforms.

That program is now being used to gather data for a prostate cancer study, and will ultimately bring in data for some 60,000 participants. The language I chose was FoxPro, because it's available in both MS-DOS and Macintosh flavors, as well as flavors for Microsoft Windows and SCO Unix. This made it possible for me to develop and test the program on one platform, then port it over to the other.

Once it was written and tested on both platforms I still needed a way to squeeze over two megabytes onto a single MS-DOS diskette, and to do it in a way that allowed computer users to install my software quickly and easily. Again the answer came through contacts made at ENTCON '94.

Armed with a vague recollection that someone I'd met at ENTCON '94 was in the program installation business, that his company was based right here in Colorado, and that the program was advertised in *Midnight Engineering*, I flipped through a copy of ME to find EZ-INSTALL from The Software Factory, 303-674-9430. Brad Whitlock, the owner was actually a speaker at ENTCON '94. His talk covered such things as accepting payment by Credit Card, custom ringing and other telephone options, sources for labels, printers for manuals, and getting the most from each of your advertising dollars.

I told him what I needed and arranged to purchase a copy of EZ-INSTALL and have it picked up by courier. After testing the last few changes in my program, and taking a very quick look at the manual, I called Brad back on the phone to request a short tutorial on the process. I'm sure I could have figured it out by reading the manual, or even just part of the manual if I'd taken the time, but I was on a deadline, juggling too many balls, and in a big hurry to get my software to the client. Brad was super. He took a few minutes to walk me through the procedure, and my master distribution disk for MS-DOS was ready about an hour after I finished his short course on the basics of EZ-INSTALL.

Indirectly, I've made some contacts through my first article on ENTCON '94. One came through conversations with Ron Smith about RS-485 networks, RS-232 to RS-485 conversions, and other strange things in the serial communications and control world.

I'd found Ron's ad for R.E. SMITH, 513-874-4796, in *Midnight Engineering*, and had a client who was considering a project that just cried out for some of his products. I introduced myself, asked my questions, learned a great deal by listening to his answers, and then asked what he'd thought of my article. It turns out that Ron had signed up for ENTCON '94, but something came up and he had to bail out at the last minute.

We talked for quite a while on several occasions about the con ference, control applications we'd each done, and some of his products. These included RS-485 networks, relay cards, analog I/O cards, digital I/O cards, and one new combo card that boasts RS-485 or RS-232 operation, Opto-Isolated inputs, Relay Outputs, and the source code to control it all from Quick Basic on an IBM compatible PC.

Before long Ron had sent me a couple of slick cards to check out and possibly write about in future articles. I've looked at them briefly, and they appear to be great tools for monitoring and controlling all sorts of things. I plan to use them for monitor ing charge and discharge cycles on some of the batteries J. Gaudio Company uses in our video production work. We're also talking about using his boards if my client ever decides to actually build the project I called Ron about in the first place. I may even be writing documentation for some of his new products.

Personal networking is essential to the Midnight Engineer. None of us can know all the answers. But knowing who to call to find the answers, and to get the support needed to get the job done in the time available is easily the next best thing. In some ways it's even better than knowing all the answers yourself, because it gives you the option of putting several people to work on your project, all at the same time. It also works the other way. Business comes to you when lots of people know what you do, and that you're available as a resource for them.

Could you be another of my resources? Could I be one of yours? Maybe we should get together and find out.

If there's any way for you to get to the Denver area this next April, please invest the time to be a part of ENTCON '95. The formal conference runs from April 7th through the 9th, but I strongly recommend you mark your calender from the evening of the fifth, straight through to the tenth. The "social" parts of the confer ence offer the best opportunities to meet, learn from, and edu cate, your fellow Midnight Engineers. If you ski, great, if not you can learn to ski, or you can just come up with us to the slopes, enjoy the scenery, sit in the lounge with your portable computer, and talk with a few of your non skiing comrades about better ways to build better mouse traps.

How ever you do it, bring lots of your business cards, and any brochures or flyers you may have to pass out. You'll also need something to organize the piles of information you'll be collect ing. I did more personal networking in the few days I spent at ENTCON '94 than I have ever done at any other single event in my life, and I had a wonderful time doing it.

ME

John, Madonna, and Johnnie Gaudio are the owners of J. Gaudio Company, a computer consulting firm near Denver Colorado. John specializes in database and control system design, holds patents on computer controlled display systems, does still and video photography, and writes articles and technical documentation. He can be reached at 303-933-4497.

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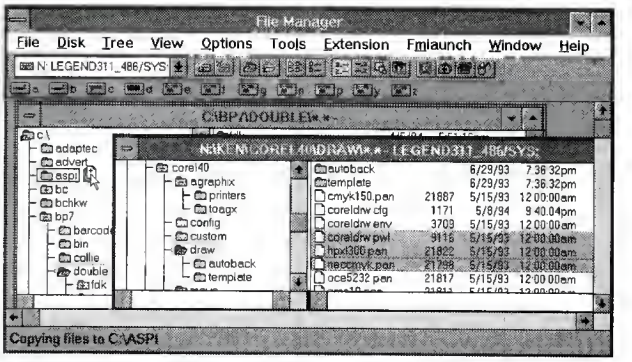

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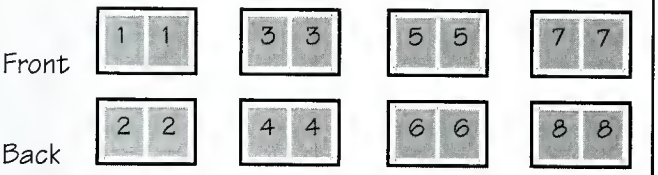

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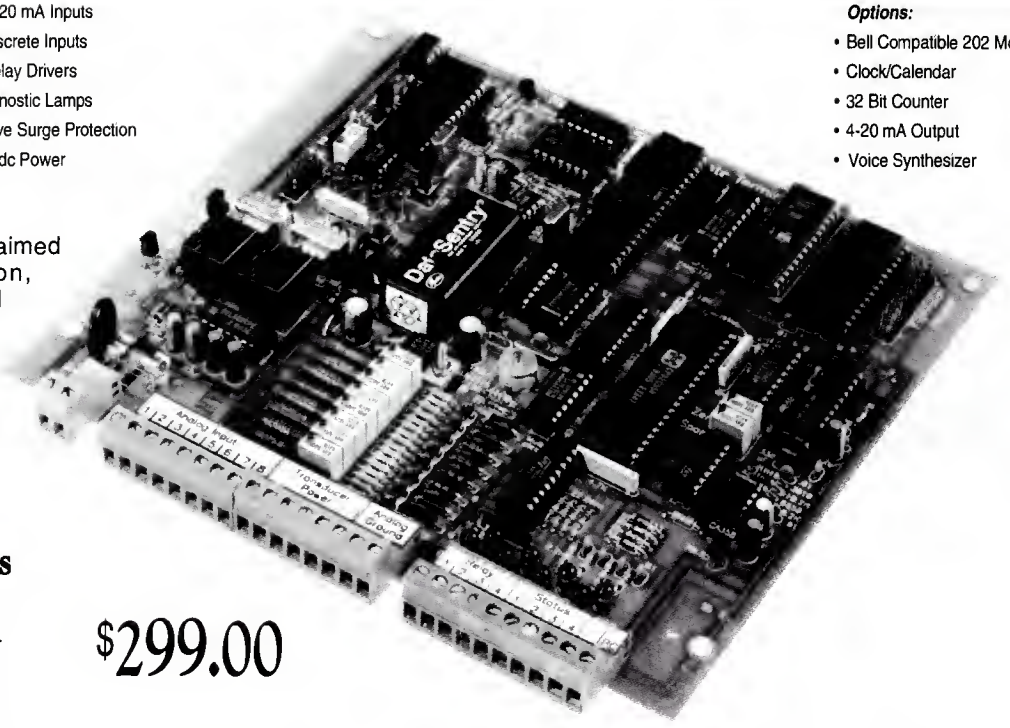

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What Do I Name This Sucker?

by Rick Martin

You've spent every spare minute in your basement workshop, concocting the widget that you hope will astound your market. Now what do you name it?

If you're planning to try for a trademark, don't take the typical manufacturing exec's approach. Don't give your new widget a descriptive name which says exactly what it is (e.g., Loud Audio Speakers). Execs frequently do this because they believe they'll gain extra leverage by describing the essence of their product in the trademark.

That might very well be true, however our free society doesn't condone the monopolization of common adjectives to describe products. Our English language is public property, a fact you don't want to forget when you're naming your invention with an eye for a trademark — either now or later.

Trademark rights are a form of permanent monopoly for particular words, slogans, or logos.

Trademark rights are a form of permanent monopoly for particular words, slogans, or logos. It wouldn't be fair to grant a monopoly to a firm whose logo was simply a drawing of the Rocky Mountains, for example. This would forbid anyone else from ever using a similar logo for like products. Our society believes the Rocky Mountains, like the English language, are public treasures to be shared by all. Our society won't enforce any law that gives you a monopoly on descriptive words or logos. (A few narrow exceptions exist.)

So What's A Midnight Engineer To Do?

You could follow the example of some of our economy's heavy hitters who chose arbitrary trademarks—Exxon, Xerox, Kodak. They coined new words that were simply a collection of letters which meant nothing. Choosing an arbitrary trademark when you're one of the little guys takes guts because the product name has absolutely no descriptive value at the beginning of its product life cycle. Prospective buyers have no clue as to what you're selling. While the big guys can afford to pour the necessary bucks into ad campaigns that will make their new trademarks household names, synonymous with their products, you may not have adequate funding to do the same.

Regardless of whether you're the new kid on the block or one of the big boys, coining a new word will make it almost certain that you'll be granted a monopoly on the name you choose. Or choose something between the descriptive and arbitrary trademark.

Suggestive Trademark

Not quite as gutsy as the Standard Oil executives, but not willing to take the safe road of the weak, purely descriptive trademark? Compromise and choose a suggestive trademark. This is one that hints at what your product does, but requires the buyer to make some additional mental steps. A classic example is "Tennis In The Round." Sound like a round tennis court? Nope. It's a circular tennis work-out arena, with pie-shaped courts and a central multi-barreled ball machine which allows several single players to rebound off a central column.

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Reader Service Number 138

The purpose of a suggestive trademark is to tease the prospective buyer with tantalizing hints at what the product is without disclosing pertinent details.

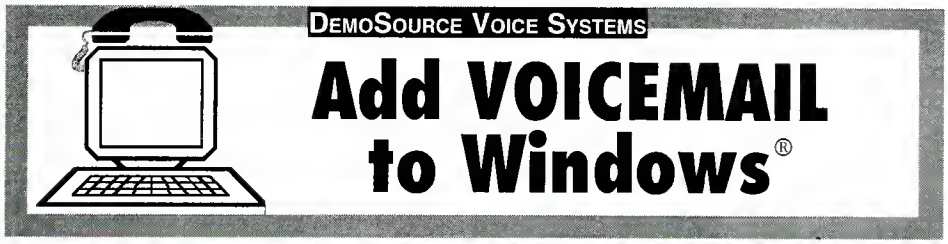
Here's another good example of a successful suggestive trademark. When I practiced in Florida, I dealt with several products for the elderly. One was a mechanical hearing aid shaped like a sea shell. The inventor wanted to name it the Shell Hearing Aid. Think the United States Patent and Trademark Office would grant a monopoly to this nice man forever for the use of those descriptive words for his shell-shaped hearing aid? Not a chance!

I tossed around a few ideas and offered this suggestive trademark, "Ear Awake." This name gives the prospective buyer a general idea of what the product is about, but doesn't disclose much more. Unlike an arbitrary trademark, though, these words are common English words and so it could never be classed as an arbitrary trademark. It doesn't matter though; this little name and the inventor's marketing and manufacturing talents have earned him customer acceptance of a simple mechanical device.

How Adventurous Do You Feel?

So what do you call your invention? If you have real guts, make up an "alphabet soup" trademark. If you're not quite that adventurous, but you still want to be creative and tell a little about your product, compromise with the suggestive trademark. Whatever you do though, forget the whimpy, descriptive name that says exactly what the product is or does.

Having chosen a name, save yourself some pain and expense. Hire a patent attorney to conduct a federal trademark search before you use your new trademark in commerce. Trademark infringement lawsuits are expensive and painful.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ME

The Patent Law Offices of Rick Martin in Longmont, Colorado, specialize in helping people who have intellectual properties they want to protect. His niche in the patent market is the developer who recognizes his need for business advice as well as patent law expertise. Martin's first career involved twenty years in the sales and marketing of computer software and explains his pragmatic view of patents and his insistence that his clients look at the big picture. He recently completed presentations at federally funded inventors workshops in Orlando and Dallas and is scheduled to speak this fall at similar workshops in Iowa and Kentucky. Interested inventors may call 303-651-2177 for the free handouts "Early Stage Financing" and "The Difference Between Valuing and Pricing Products" he uses at these workshops.

Component-Oriented Software — 2

by Jack Krupansky

Component-oriented software (COS) shows great promise for radically improving our ability to deliver sophisticated software solutions. In my previous article we examined a number of issues which will determine the effectiveness of COS at solving real world problems. Let's look at additional technical and business issues and highlight the related entrepreneurial business opportunities.

Component Management

An aspect of COS that hasn't gotten much attention is management of components on a system or even a network. What if I have a lot of applications that each come with all the components it uses and a subset of components are the same between applications? Do I get (or want) multiple copies of components? And if I do want to have the common components shared then how can I uninstall an application without disturbing the other applications? And how are versions of a component identified? And how is compatibility between versions indicated?

Build yourself a reputation as a crack component builder and get bigger advances and more payments from higher sales volume.

I presume that we will evolve towards a technology in which components are separate entities such as Windows dynamic link libraries rather than being hard-linked into the application. Hard-linking is an option, but it interferes with user-driven customization. Even if a development organization chooses hard-linking, how do they deal with sharing of components between their development groups?

We need to deal with component naming conflicts. You and I can both develop components for different functions but have the same name and a developer wants to use both components in the same application. This naming conflict must be resolved by renaming one of the components. Solutions might be a centralized name prefix registry, a name substitution feature in the linker, or a utility to rename references within a binary component.

We need usage analysis tools that will be like looking into a microscope and seeing all the objects buzzing around. You could then filter and analyze and summarize to your heart's content. The boundary between applications will blur and system and network level views will be as important as looking at a single application.

In theory, I could run an application over the network and rather than a large executable file being loaded into my machine individual components could migrate to my machine as needed. I rarely use even 15% of the features in an application. This also presents opportunities for network licensing software. And opportunities for new forms of installation software.

Traditional network analysis tools focus on systems, processes, and messages. With COS we introduce new levels of traffic complexity. Seeing what processes are sending what messages between what machines won't tell you a lot about what objects are doing what operations.

Tomorrow's smart users will be able to mix and match software. They will take a component from one application and use it in another application. Aftermarket add-ons will improve their productivity. No longer under the tyrannical control of the system manager or even the designers of the application! Can you say support nightmare? Can you say job security? We'll need utilities that track down who's sticking what components where they shouldn't.

Licensing Models for Reuse and Profit

Royalty-free licensing works best for high-volume low-cost products. Per-user and royalty licensing work best for lower volume, high-priced products. There are lots of variations and it is mostly a matter of what the market will bear. But in the coming world of components, things will change. One of the proposed licensing schemes is per-use with some sort of metering. I'm sure others exist and more will follow. My view is that we need simplicity. And a way to assure that component creators are equitably compensated for their creativity and ability to spot market opportunities.

We need usage analysis tools that will be like looking into a microscope and seeing all the objects buzzing around.

One approach would be to think of components in much the same way as books. The author might get an advance

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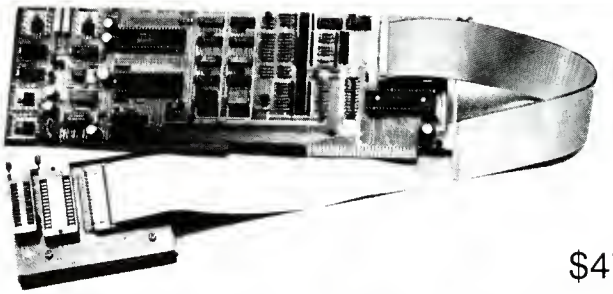

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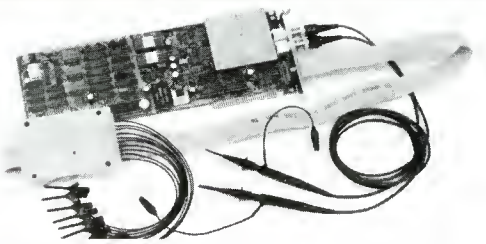

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and future payments based on sales. Build yourself a reputation as a crack component builder and get bigger advances and more payments from higher sales volume. Or build an occasional high-value component that sells to a niche market for a premium price. Just like some specialty books.

Sub-Licensing

Another nasty issue comes from the OOP concept of inheritance. You can develop a component that derives part of its functionality from another component. Or maybe your component is really just a clever assembly of commodity components. Now you need to be able to sub-license those other components. Royalty-free licenses are the most appealing, but you'll have to be careful because some component venders may explicitly disallow distribution in situations where their component features are essentially passed through with minimal added value. This might seem disturbing, but the usual intent will be to deter shady venders from merely repackaging components and then stealing the original venders prospective customers. Imagine taking someone's spreadsheet grid control and merely adding a fancy border or changing some colors. Imagine being on a jury and trying to determine whether the repackaging adds significant value or competes unfairly with the original.

On the other hand, if you have a component that is a good candidate for such abuse you might consider marketing it for precisely that use with either royalties or significant fees and just don't sell it as a commodity in the first place.

Components must be cheap enough so that after paying for each of the many components used by your software you can still make a profit. Component venders may be tempted to charge significant fees, but I think the trend will be toward a smaller number of big ticket components and vast numbers of cheap or royalty-free commodity components.

Evaluation vs Production Use

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component in my product, I am not willing to pay that price without being able to first evaluate its suitability. Some venders will be willing to let you test drive the real thing for a limited period of time. Some will have stripped-down evaluation kits. The bottom line is that convenient, flexible evaluation is essential for a thriving component-based software industry.

Discipline Needed for Robust Software

COS will be a big boon for hard-core, disciplined engineers. Applications, subroutine libraries, and simple components such as VBX controls can be thrown together by almost anyone. Development of truly robust, high performance, and compatible components will take real engineering discipline. Armies of over-funded, mediocre talent armed with fancy tools simply can't compete with lone, disciplined engineers who methodically work through the COS issues. Hardware engineers intrigued by software but offended by the lack of discipline of today's software practitioners will see component development as an attractive opportunity.

Intellectual Property

A future article will explore the intellectual property issues relating to components, ownership of standards and de facto standards. But I will say that these issues are critical to the acceptance of COS and its viability as a business model for component producers. The most difficult step will be getting to the point where specs for compatible components are not owned by a component creator although the component creator may by de facto control changes to the spec. Examples are Hayes modem commands, PostScript, and Visual Basic compatible macro languages.

Distribution Models

Within a few years even a modest software effort will involve hundreds if not thousands of components. Ordering all those components from lots of venders will just not be tolerable. Just imagine all the floppies and paperwork. Encrypted CD-ROM and on-line libraries are likely solutions. Thousands of components can fit on a single CD-ROM. Larger firms will license entire collections of components and us little guys will license components as we need them. There will be shareware opportunities. And opportunities for niche entrepreneurs to compose specialized libraries with selected and matched components to simplify development of vertical applications.

I can imagine individual component creators joining component co-ops so that customers don't end up having to purchase individual components. Big ticket, large scale components could still be distributed separately. Plenty of opportunity to partner with fellow component creators or get your great invention bundled with some big ticket package.

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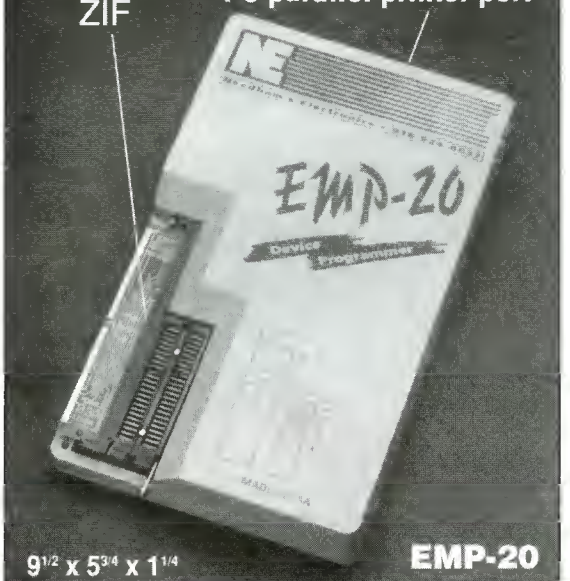

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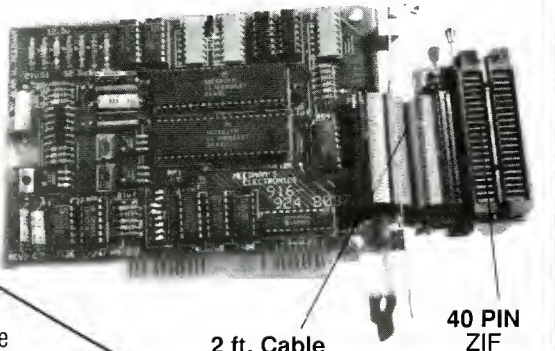

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Model-View-Controller Paradigm

Many Windows applications will be built using GUI (Graphical User Interface) tools that let you develop an application without writing any code. But for other than trivial applications you will need to develop some logic (either as code, a flowchart, or by wiring components together.) The visual tools make it easy to just insert that logic where it's needed. Unfortunately, for sophisticated applications that's the worst thing you can do. Tying the application logic tightly with the user interface restricts your flexibility to change one without affecting the other. It makes more sense to have a well-defined fire wall separating the user interface from the application logic.

The Xerox PARC researchers called this the Model-View-Controller (MVC) paradigm. The model is the application logic which expresses how the problem solution is modeled within the computer. The user interface is a combination of a view and a controller which are roughly analogous to the display and input. Although a typical GUI has discrete events for keyboard and mouse input and painting of the display, the interaction between the two is less well understood and a cause of programming problems.

Techniques and tools for mapping the mouse position to a modeled application object and optimizing partial redisplay of the changing model is a challenging aspect of sophisticated applications such as CAD or desktop publishing. The MVC paradigm can be applied to non-GUI situations as well. Few programmers really understand this paradigm, so there is plenty of opportunity for consultants and component developers to exploit it. Focusing your engineering talent on modeling and views will allow you to create long-lasting value. Customers will appreciate that their investment in your technology will retain its value over time regardless of whose GUI is in favor this week.

Training

Lots of money will be spent (and made) on training for COS. Most of it will go to the larger, established training firms. But there will still be plenty of narrow or specialized niches for entrepreneurs to exploit that are too small or too bizarre for the big training organizations to go after. If you have years of experience in a niche your expertise and interest (and modest rates) will look much more attractive to the client. The real opportunity is that you can show the client exactly how to apply COS to their specific problem. And, for a modest fee, you can even get them started and be there when they need assistance.

Consulting

Where there's complexity there's a need for consulting services. It's really easy for a company to send their developers to object technology school for a week and think the next project will be a cakewalk. That's where you come in. Cleaning up someone's mess isn't as bad as it sounds. There may be schedule pressure, but management can be so relieved just to

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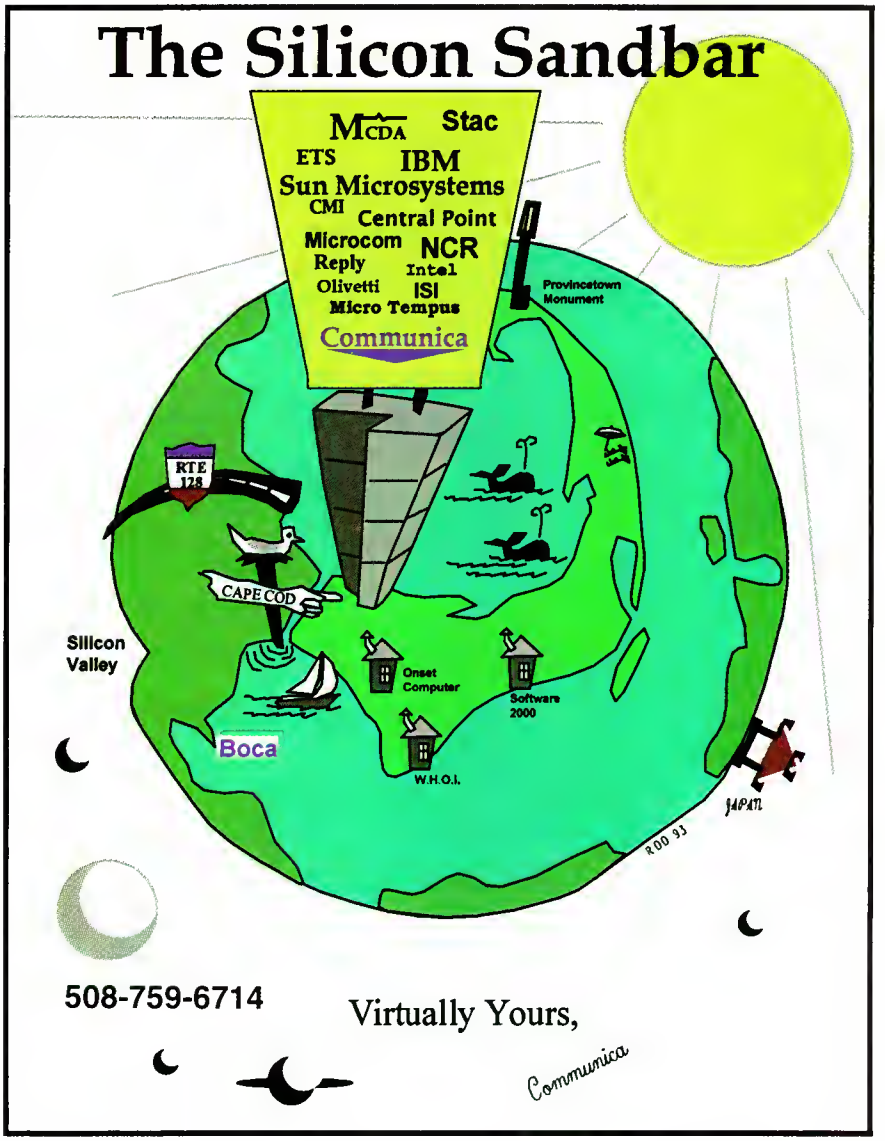
realize that the project is getting back under control that they don't mind paying your outrageous (but reasonable) rates. In fact, I think I'd rather come into a project late in the game and become the hero than have started a project under unreasonable expectations.

Keep in mind that the early consultants get the fat worms. As a technology becomes old hat the client realizes that anyone can do it and there is no reason to pay high rates. Windows programming used to pay extremely well.

Some of the emerging COS technologies that are ripe for exploitation are Microsoft's OLE, IBM's SOM, object request brokers, and implementation details and nuances of the various object models. Mixing and matching of technologies will become important and a great opportunity.



Testing

Testing is critical for software components. We need tools for testing the non-interactive aspects of components. Interactions between components must be tested. Components must be tested to make sure they work together.

One of the keys to good testing is a comprehensive test plan. Few software people really understand how to do this and lack the discipline to carry it out. A good test plan requires solid specifications for the components. I can see companies paying a lot to bring someone in to do a quick review of their components and propose the outline for a test plan.

Good testers are hard to find and hard to keep and the situation will only get worse as the COS industry matures. Even with a good test plan it takes a lot of talent to ensure that the test cases really test the software properly. And as components get more sophisticated the problem gets worse (or better for the entrepreneur.)

Tools

Microsoft's strategy seems to be to divide the software industry into two camps: component builders and solution providers who glue components together into complete solutions. They envision components in C/C++ and solutions in BASIC and Microsoft provides the tools for both. This clean division sounds great for now, but it doesn't address the long-term growth in the use of objects in all aspects of system design. After all, with COS, one person's solution is supposed to be someone else's component. Between and beyond the two poles there will be many gaps to be filled by entrepreneurial tool venders.

Disincentives for Reuse

The maintenance cost of shared code can be higher since the code may have to do more to satisfy more users. You must do a better job of documenting and testing shared code. On the other hand, by generalizing the code and focus attention on any weak spots you can make

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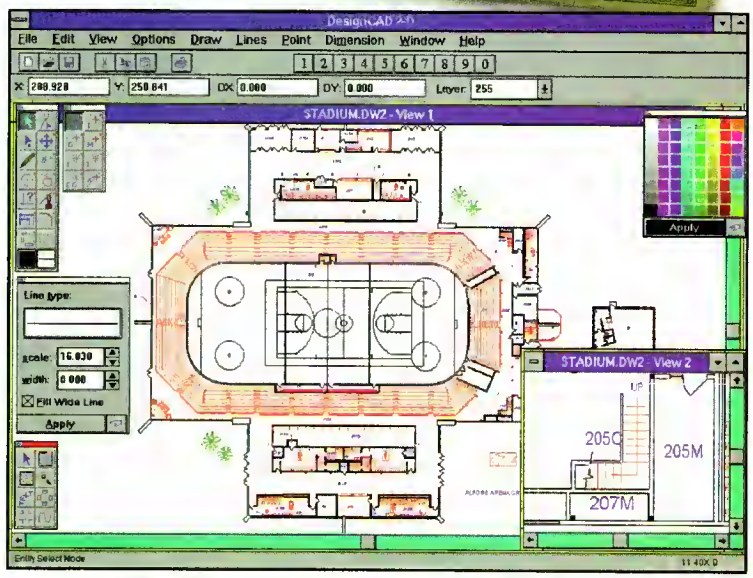

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it more robust and less in need of traditional bug fix maintenance.

Once you start sharing code you also take on the burden of compatibility. Within a project it is easy to see how a component is used and to judge the impact of a change to the component. The process becomes more tedious when other projects or companies share a component. It can become the kind of nasty straitjacket that creative types try to avoid. At least a few consultants will make a lot of money helping companies share components.

Once you start sharing code you also take on the burden of compatibility.

The additional levels of support for code reuse will have to come out of someone's budget. In most companies it just isn't practical for a manager to take on additional costs just to reduce the costs for another manager.

It's always possible for two groups to share code without management even knowing about it. It works best if you in fact exchange code so everybody wins at nobody's expense. And, it's always possible that some entrepreneurial consultant may decide to focus their energies on helping organizations deal with the non-technical reuse issues.

There will be a great management backlash against object technology when they find out that startup costs and maintenance costs are higher than they expected. Gurus may have helped to get the system up and then turned maintenance over to average developers. The only solution is to keep the design as simple and clean as possible. Object technology gives you tools to do great design, but can't turn mediocre designers into great designers.

Conclusions

Additional issues will arise as we progress further into the world of software components. Let's welcome the problems and pitfalls because each will spawn even more entrepreneurial business opportunities. In fact, every "solution" will create even further opportunities! Objects are here to stay and the next ten years will give us ample opportunities to display our entrepreneurial skills.

My real hope is that COS will restore the sense of craftsmanship that we lost when productivity began to be measured in terms of KLOC (thousands of lines of code) per month

I must strongly emphasize that COS is evolving and you must be careful when placing large bets on specific technologies or markets which have not yet converged. But don't wait too long before deciding to pursue your ideas.

My real hope is that COS will restore the sense of craftsmanship that we lost when productivity began to be measured in terms of KLOC (thousands of lines of code) per month. Components should be more like a gems and less like cancerous tumors. A good metric for the maturity of COS will be the degree to which portions of end-user applications can themselves be used as components for other applications.

And finally, software development should be satisfying, stimulating, and even fun. There should be a sense of pride in the result. COS can help us achieve that goal. And we can make COS possible.

ME

Jack Krupansky runs a one person software business, Base Technology, which develops and markets the Liana object-oriented programming language and offers Windows software development consulting. He may be reached at 303-440-4558, Fax at 303-444-4186, e-mail at 70642,2662 on CompuServe, or snail-mail at 1320 Pearl Street, Suite 110-B, Boulder, CO 80302.

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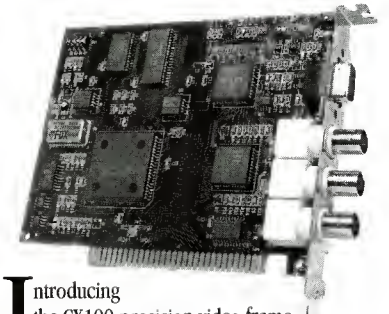

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Reader Service Number 129

Right Out Of The Box

Small companies are always sending me products to try out and report on. ME policy is to review and report on only those products that I or an ME reader actually use — whether the product comes from an ME advertiser or not.

A couple of months ago, Thomas Gsell of Logixell Electronics (in Canada), sent me his product: ***The Real Logic Analyzer.*** His hope was that I would evaluate and report on it. He also mentioned in his cover letter that it might come in handy for testing the timing of limit switches on my printing press or the electronics in my camera. He is absolutely correct, since the press will be retrofitted with enough monitoring and embedded technology to allow me to run the entire system from one location, single-handedly.

His complete product is composed of the logic analyzer software ($79.95), 6' test cable ($99.95), and printer port buffer ($39.95) to allow signals of greater than +5v to be monitored. Of course, we're talking about using the printer port as an input to capture up to five input channels. The faster your PC, the higher the potential sampling rate. Since I don't need a 100Mhz sample rate for the work I'm doing on the printer press, this product will work nicely.

This is the kind of product I have always appreciated, both in concept and in use. Even though it has obvious limitations, it has a variety of uses. Beyond that, it is a perfect Midnight Engineer type product that fills a niche need without being capital and manufacturing intensive.

It's Saturday morning and I'm chasing this section of the magazine through the printing press again. I couldn't reach Thomas this morning, but I wanted to ask him why he didn't make a bigger deal out of the price in his ad on page 77. Plenty of technical info and nice layout to the ad, but I would have made price a big factor in the ad. Maybe we can get him to write us an article on the development of the *The Real Logic Analyzer.* ***—WEG***

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Lee Perryman, Deputy Director and head of technology development, Associated Press Broadcast Services, Washington, DC

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6	31	56	81	106	131
7	32	57	82	107	132
8	33	58	83	108	133
9	34	59	84	109	134
10	35	60	85	110	135
11	36	61	86	111	136
12	37	62	87	112	137
13	38	63	88	113	138
14	39	64	89	114	139
15	40	65	90	115	140
16	41	66	91	116	141
17	42	67	92	117	142
18	43	68	93	118	143
19	44	69	94	119	144
20	45	70	95	120	145
21	46	71	96	121	146
22	47	72	97	122	147
23	48	73	98	123	148
24	49	74	99	124	149
25	50	75	100	125	150

Embedded Product Startup

by Dennis Stearns

Ambitious to work for myself, my wife Susie and I decided to move from Dallas back to central Arkansas. Most everyone will ask, "why would anyone move to Arkansas to start a technical business?" We are both from Arkansas and I had more contacts for work in Arkansas than I did in Dallas.

I had worked as a designer and technical support engineer for a company in Dallas. While travelling on company business, I met Gerald Courtney, an entrepreneur in North-West Arkansas who owns Courtney Electronics, Inc. At the time, Courtney Electronics was little more than a one man operation designing and manufacturing custom motor controllers. Gerald was looking for investment capital, and at the time I could afford it, so I decided to buy into his company. The relevance of this will be apparent later.

I knew from the start that there would be very little call for custom electronic designs or even custom software in Arkansas. It was evident to me that I would have to travel out of state a great deal as well as get into industrial automation and controls to be able to survive. In my own mind, I thought that it was very important to have one or more products to sell to help get through the slow times of automation work.

With this in mind, I got out the old box of ideas that were documented over the past several years. I knew the process of developing products would be a very slow one due to the fact that I had to continue making money during normal business hours. The only time left for development was most often midnight.

Of all the ideas that were in the various files, there was one that came to the top: a low-cost data acquisition board. I spent the next several weeks gathering documentation on as many existing products as I could find. The main items that stood out were: 1) most all boards with analog input and outputs were all 12-bit boards, 2) most boards were equipped with very fast A/D converters, and 3) almost every one seemed to be over-priced when compared to what I wanted to sell my board for. The one thing that I considered, but was totally off base on, was the cost of marketing and advertising a product. I have since come to appreciate that fact, but at the time I did not have a clue.

Simple Might Be The Answer

I wanted to develop the data acquisition board with 8-bit instead of today's typical 12-bit A/D and D/A chips, to help keep cost down. I then asked myself: If my board is priced right, who will use it? The answer to this question continued to point at education, automatic test/calibration equipment, light industrial control and the hobbyist.

Using my original documentation as a starting point, I designed a low-cost data acquisition/control board. The first board, ADIOS (Analog - Digital Input - Output System), was designed with 8 channels of 8-bit A/D, 2 channels of 8-bit D/A, and 48 programmable digital I/O. When the first design was completed, there was an obvious need for a companion board to go with the ADIOS board — A board with counter/timers chips as well as digital I/O seemed to be the logical companion. The second board, CTIO (Counter/Timer - Input/Output), was designed with 6 independent 16-bit timer/counters and 48 programmable digital I/O.

At this point with two boards designed, I thought I was on my way to great and wonderful things. What I came to realize was that the easy part was finished and the road ahead was rocky and dark. Funding, manufacturing and testing, marketing, packaging, documentation, software examples, and sample applications on how to use the products were all task which still had to be addressed. After realizing all of the things left to do, I was brought down to earth with and enormous thump. Not knowing any better, I proceeded with the only tasks out of the group that I felt comfortable with: Testing and software. I designed test fixtures for both boards and then began the long process of writing test software and example programs. The example programs are written in BASIC, C, and Visual BASIC for both the ADIOS and CTIO boards. I decided to write example programs instead of "software drivers" for one reason: Every time I have purchased a data acquisition/control product that came with software drivers, the drivers were quickly discarded and application specific software was written. In addition to the software examples, I wrote a user interface program for each board so that they could be used right away. All configuration of the board (except base address and Interrupt selection) is

I wanted to develop the data acquisition board with 8-bit instead of today's typical 12-bit A/D and D/A chips, to help keep cost down.

accomplished on screen with a mouse or the keyboard.

Manufacturing and Funding

During the same time that the software was being developed, I started looking at manufacturing and, more importantly, funding. The hard reality became clear very quickly. I did not need to worry about manufacturing because, well, there wasn't enough money available to proceed. After being stagnant and very frustrated for several weeks due to money problems, I remembered a comment my father had made to me years earlier during a weekend fishing trip. He said, "40% of something is a whole lot more than 100% of nothing." I'm not sure if the comment was an original thought or just one he passed along, however, it made me start thinking about alternative solutions to my financing problems.

I had met and worked on some midnight projects with Rob Renner (President of Fantum Engineering) while I was in Dallas. Now, I turned to him for advice. Rob agreed that the products had possibility and showed an interest in helping with the funding problems as well as an interest in the manufacturing of the boards. Agreement was reached that Fantum would fund the major portion of the initial development on both the ADIOS and CTIO boards in exchange for manufacturing rights and a percentage of the profits.

When the funding and manufacturing problems were solved, attention was turned to writing the users manuals. While working on the users manuals, a thought came to mind that a logical addition to the products would be a software package which would allow you to view and manipulate any data collected with the boards. Immediately I thought of SPLOT, a DOS software package which was written by Bill Hood, one of the instructors I knew in the engineering department in graduate school. SPLOT is a data plotting software package that will allow you to plot 2D and 3D data. It wasn't very hard to convince Bill that it would be a good combination and would provide additional exposure for his software. We quickly reached an agreement that would allow me to offer the software as a companion product with the data acquisition/control boards.

We also reached an agreement allowing me to market the upcoming Windows version, WPLOT. With WPLOT it is a very simple task to bring complex 2D and 3D plots of data into a proposal.

Testing Production Units

During the next month while working on the users manuals, the first preproduction units came off of the assembly line and were ready for testing. Although I had built prototype test fixtures for the two boards, it was necessary to have two test fixtures. I needed a test fixture to continue writing the sample programs and another test fixture was needed at Fantum for final testing. At this point, Fantum decided it would be time and money well spent to have circuit boards fabricated for the test fixtures. The boards were designed so that they could be used as test fixtures

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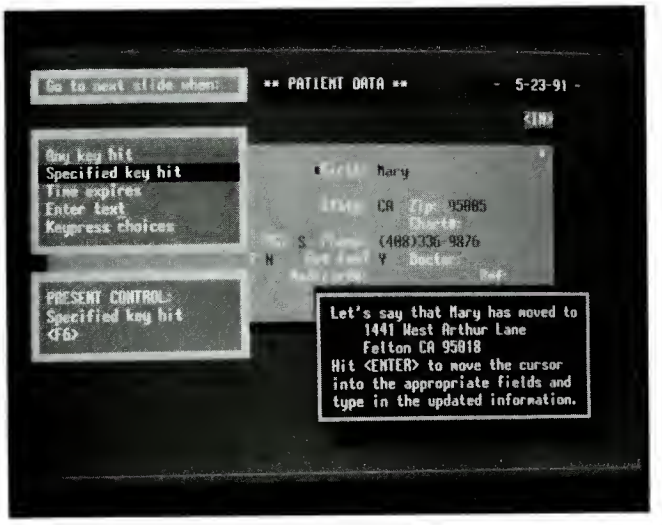

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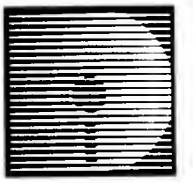

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as well as be used as external interface boards and sold as add-on products for the data acquisition/control boards. As soon as this happened, we instantly had two external add-on products. One is used for the analog input and output sections on the ADIOS and the other is used as external drivers/indicators for the digital output sections of the ADIOS or CTIO boards.

During the seemingly never ending effort to write the users manuals, two unexpected applications fell into our laps. The first was an application to use the ADIOS board to construct automatic test and calibration equipment for Courtney Electronics and the second was an embedded application for the ADIOS board using the hardware interface in a PC based video game machine.

Courtney Electronics is mainly involved in the design and manufacture of custom motor controllers. They offer products that range from simple motor controllers using relays to complex Pulse Width Modulated motor controllers equipped with dynamic braking and pulse to pulse current limiting. During a meeting with Gerald Courtney he asked, "Where and how can these products be used?" At the time we were standing in front of his manual test station. I turned and pointed to the test station and said, "right there." The discussion continued from there into a detailed explanation of the ADIOS board implementation with additional external hardware so that all of his products could be tested.

Considerable time was taken to minimize the additional hardware necessary to be sure we could test all of Courtney's products. Three external boards were designed to work with the ADIOS (or CTIO) board. The first board was designed to allow the digital Input/Output of the ADIOS or CTIO board to interface to the many different DC voltage levels present in his products. The DC I/O board can be configured to work with 12, 24, or 36 volt DC signals. This board contains: 8 - 5 amp mechanical relay outputs, 8 solid state outputs (sink and source 100mA), and 8 opto-isolated inputs. The second board was designed to allow the digital Input/Output of the ADIOS or CTIO board to interface to the many different AC voltage levels present in his products. The AC I/O board can be configured to work with 24, 110, or 220 volt AC. This board contains 8 5amp mechanical relay outputs, 8 solid state outputs (TRIAC), and 8 opto-isolated inputs. The third board was designed to interface the ADIOS analog input and output sections to the products. Many of the products require analog signals which were beyond the voltage and current specifications of the ADIOS board. This external board allows us to provide 2 high current outputs up to 30 volts and the ability to read 8 analog signals with voltages between 0 and 35 volts DC.

After the first versions of these two boards were completed and installed, I wrote software to implement the testing of all of the products. Not only did this new automatic test station cut testing time by approximately 75%, it improved consistency and also provided detailed testing and calibration information for future reference. The programs were written so that all of the critical voltages and times were measured and recorded to disk. Any time a failure is encountered during testing, the programs will make a recommendation about the most likely cause for the failure.

Maybe Others Could Use This Solution

Gerald and I were talking several weeks after the test station was complete and he made the comment, "I bet other people could use these boards with your products." With that statement, it didn't take long to make a few minor adjustments on the boards (different type connectors), and again I have additional external products to sell that were designed specifically for my boards.

During the same time period that I was working on the Courtney Electronics automatic test station, Rob Renner called with another application for the ADIOS board. He had received an order for an embedded application which would utilize the ADIOS board for the hardware interface. The initial order was for 200 units with future orders that would possibly add up to 1,000. The application was a PC based "games for amusement" machine.

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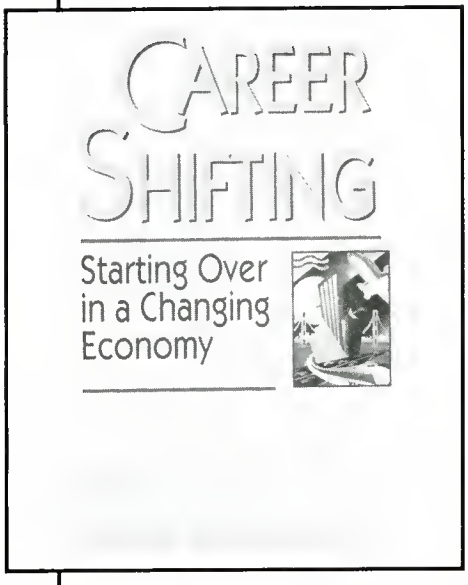
The Bookshelf

Career Shifting (subtitled: Starting Over in a Changing Economy), by William A. Charland, Jr, ISBN 1-55850-259-9, Bob Adams Inc (publisher) 260 Center St, Holbrook, MA 02343, 230 pages, $9.95

I met Bill Charland at the Tri-State Economic Development Conference I was speaking at in Oberlin, KS (see my editorial in this issue). He also was a speaker at the conference and his topic was very much in line with his book. After he heard my presentation, Bill asked for several copies of ME to take back to Denver with him in exchange for a copy of his book to review here. Ends up he writes a sindicated column for the *Rocky Mountain News* on the topic of *Changing Careers*.

Well, he put together a really nice piece on me and my magazine and even weeks later I am still getting calls from all over the country as the column gets picked up by this or that newspaper.

I wanted to make you aware of Bill's book independent of him running an article about me and ME. I have mentioned many times in my editorials about "Change" and how it can affect us as budding entrepreneurs or even as seasoned businessmen. This book is the one I am now recommending for all the callers I talk with who are looking for some direction and encouragement to get out on their own.



I talk to people every day who are working (or just out of work), but want something to kickstart their new career. They seem to be building themselves up for something, but they are stuck — nothing has jelled for them that somehow defines, or at least, shows the way to their new future.

Career Shifting is full of all kinds of ideas and case studies. The book takes a very broad brush approach and contains all sorts of interesting informnational tidbits that tend to outline how industries are changing — and how you can change with them or even to enter a new field as an outsider in the midst of this changing scene. Telecommunications to tourism, bill covers a lot of ground.

In the book, you'll find charts like the one which shows that new businesses were forming at a rate 5 1/2 times faster than the population was growing during the 1980s. In the appendix there are some unique aids that will help you analyze your task/skill/trait abilities in ways you may not have thought of. One of my primary beliefs is that if you don't know yourself completely and honestly, any success you have will be mostly due to luck. Luck is always welcome, but I've noticed plently of the failures in business seem to stem from the person being ill-matched to their business.

I like to recommend books that I think will help people get their own answer. My experienc has been that usually people are looking for too specific an answer — one that they can simply adopt. Bill's book is the kind that will get you out of the rut in your thinking and on your way to finding your own compelling ideas for your future.

WEG

An appropriate self-contained standing enclosure was designed to house the PC and other associated equipment. The PC system used an SVGA monitor, an 8-bit sound card, an ADIOS data acquisition board, and all the other standard stuff. The flexibility of the ADIOS board allowed us to design a simple external board to interface with the push buttons, potentiometers, coin counters, and dollar bill counters, etc..

I was lucky enough to be able to write most of the software for this application. I was like a little kid with a brand new toy, being able to write code for video games and getting paid for it!

The software was written to control the games, counts number of times played for the 4 different games, track the top 10 scores with players initials for each game, and record when service personnel collected money from the machine. When games are not being played on the machine, it is used to display advertisements of various products with background music and audio product descriptions which are sequenced through every 15 seconds. The software was written so that all of the background pictures, music, game responses, and advertisements can be changed very easily. This will allow the overall feel of the machine to change on a periodic basis.

All of the sudden I look up and its been 2 years since I started P.T.S. After much hard work, some luck, and working with good people, I have been able to bring together good combination of products. After putting together these products and pricing them affordably, the next step is making people aware that I have them. I am just now getting into the initial stages of trying to market my products. As I am finding out, this is a whole different challenge in itself.

ME

Dennis Stearns may be reached at PTS, 12 Rockwood Rd, Cabot, AR 72023, 501-843-2705.

Patent Discussions — 2

By Curtis L. Harrington

Courts keep pulling for change in the direction of patentability of software as the U.S. Patent and Trademark Office continues to resist such change. The resistance has extended to the shenanigan level as is exemplified in the recent case embattled case; *In re Alappat* 31 USPQ2d 1545 (CAFC 1994).

This case was earlier reported as *Ex parte Alappat* 23 USPQ2d 1340 (Board of Patent Appeals 1992). The claims in the subject patent application were directed to a "device" for converting vectors in a data list. This invention was in essence a method for treating computer screen data to smooth out the displayed line trace. In the more recently issued case, it was revealed that the invention was primarily intended for use with an oscilloscope output shown on a cathode ray tube.

The claims, and particularly the broadest claim, was direct to a "rasterizer" and included structure such as "means for determining a vertical distance of vectors," "means for determining an elevation of a row of pixels spanned by the vector," "means for normalizing the vertical distance and elevation," and, "means for outputting illumination intensity data as a function of the normalized vertical distance and elevation."

The physical devices used to perform these tasks included several arithmetic logic circuits, barrel shifters and a read only memory, all digital computational devices.

The history of the case, however, provides the most interest and controversy. The above claim was first disallowed by the Examiner. On appeal to the Board of Interferences and Appeals, a three member panel reversed the Examiner and indicated the claims to be allowable. The Examiner, and probably at the direction of others higher up in the Patent Office, requested reconsideration. In response, an eight-member panel of the board of appeals was constituted and including the Patent and Trademark Office Commissioner, Deputy Commissioner, Assistant Commissioner, among others, mentioned to emphasize the top-heavy, policy making composition of the board. The eight-member panel then promptly held the claim to be unpatentable, a move which has been popularly referred to as a reversal more based upon the preferences of the Patent and Trademark Office management and policy rather than an objective examination of the merits of a particular case.

The CAFC, with due discussion and agreement of the legality of having the case pulled back into the eight-member board with the Commissioner sitting in judgement, promptly reversed the holding of the eight-member board and held the claim to be statutorily allowable subject matter.

Technically, arguments against patentability were that each "means for" portion of the claims was in fact a process step being performed by a conventional computer. The CAFC pointed out that not only did the opening paragraph claim a machine (rasterizer) but that since "means for" claims are to be interpreted narrowly, as including the devices disclosed in the patent and their equivalents, that the claims are interpreted as having the devices in each portion of the claim.

But how does this result guide business people to know what is now patentable and what is not patentable, especially with an ever expanding explosion in software and multi-media? Reading thus far it would appear that if the circuitry which was responsible for each step was identifiable or at least identifiably distinct from other portions of the computational circuitry, and was identified and claimed that way in a patent application, that this would be a step in the right direction toward getting the claim allowed. This means that one who seeks rights protection should know a great deal more detail about the device in question rather than its status as a "computer," if there is to be a realistic expectation of allowability.

... how does this result guide business people to know what is now patentable and what is not patentable ...

Other comments in *In re Alappat* which give further guidance indicate that the invention should be "not a disembodied mathematical concept which may be characterized as an 'abstract idea,' but rather a specific machine to produce a useful, concrete, and tangible result." This seems to indicate that the more specialized the machine or computer is shown to be in the patent application, the greater the probability of it being found to be patentable subject matter.

Another guide is directed to the practitioner and how he drafts his claims, with the further comment "Indeed, claim 15 as written is not so abstract that it would '*wholly pre-empt*' the use of any apparatus employing the combination of mathematical calculations recited therein." Phrased another way, this is a proscription on the zeal in claiming broadly, or at least broadly enough to begin to take possession of the mathematical function for machines generally. Pushing the claim breadth to a limit which exceeds the particular application shown in the patent, but which falls arguably short of pre-empting use in all other devices will require delicate crafting of the claims and solid arguments in their defense.

Lastly, the possibility of rejection based upon an argument that the claimed invention "reads on (is capable of being performed by) a standard computer" was eliminated with the statement of a simple rule: that the claim "would read on a general purpose computer programmed to carry out the claimed invention...alone does not justify holding [the claim] unpatentable as directed to non-statutory subject matter." This

comment tends to leave open the upper limit of the "wholly pre-empt" language of the previous paragraph.

The holding in *In re Alappat* fails to cut an exact dimension into what is patentable and what is not. Principles often practiced in writing patents for computer inventions have been bolstered by the court's holding. These principles have dictated (1) the inclusion of an analog version of the invention which parallels the digital version if it is available; (2) to the extent possible attempt to identify individual components according to their function, either by block diagram, or subdivision of function or location; and (3) attempt to incorporate as much structure into the claim as is possible without unduly limiting it.

Specifically avoiding any references to restrictions on the type of mathematical functions involved in a patent, the court is seeming to open the door to all varieties of computer inventions, provided that the patent practitioner sets them forth in a concrete manner, with a reasonable degree of differentiable identification of the elements which perform the different functions in practicing the invention, and where the claimant is willing to limit the claims to a device or process which can be defined in a way which leaves the mathematics and at least some machine uses of those mathematics to the public domain.

Since the holding in *In re Alappat*, the court has had an opportunity to again consider the statutory status of a computer process in *In re Warmerdam* (CAFC 1994) 31 USPQ2d 1754. Here the invention was a method claim for generating a data structure representing the shape of a physical object, an application useful in robotics. The claimed process performed with the steps of (1) locating the medial axis of the object, and (2) creating a hierarchy of [spatially dimensioned] bubbles on the medial axis. This process was for the purpose of creating a zone within which a robotic arm would be prohibited from travelling within during its motion. Based on the earlier holding of *In re Alappat*, the Board of Patent Appeals rejection of this simple two step claim was upheld by the court. It seems to have violated the interpretive criteria set forth above in that there was very little differentiation of function, no significant infusion of physical structure or steps, and only a modicum of limitation in requiring that the method take place in a position and/or motion control machine. The patent application claims also fell short of the criteria that the claim relate to a specific machine to produce a specific result (no machine was recited in the actual performance of the claimed steps).

Claim 5, however, which was drawn to "a machine having a memory which contains data representing a bubble hierarchy generated by the method of any of claims 1 - 4)" and which was held rejected by the Patent Office Appeal Board for indefiniteness, was reversed and held allowable by the court. The rejection was based upon a lack of showing as to how a memory is produced by the steps of the process claims. The court held that since no one asserted that it would be difficult to produce the memory from the claims, that it is therefore assumed possible; and that the claim covered all of the ways of doing it.

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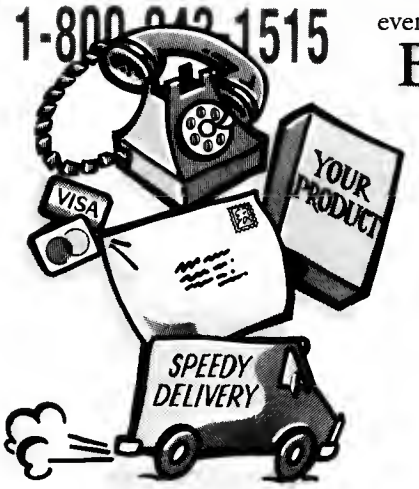

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It thus appears as if the much wider invitations to patent of *In re Alappat* are being exercised freely and supported by the subsequent holding in *In re Warmerdam*. These cases represent significant liberalizations. However, given the continued anti-computer patent stance of the U.S. Patent Office, as reflected in the manipulative re-hearing of the original Board of Appeals decision before the eight-member panel, the expanded protection to be afforded current software applicants will likely require aggressive prosecution and advocacy.

ME

CURTIS L. HARRINGTON, is a partner with the Newport Beach law firm of Hawes & Fischer (714)759-6601 and practices in the areas of Patent, Trademark, Copyright and Trade Secret law. He is admitted to practice before the state bars of California, Texas, and Arizona, and is admitted to practice before the U.S. District Court, the U.S. Court of Appeals, Fifth and Ninth Circuits, the U.S. Supreme Court and registered to practice before U.S. Patent and Trademark Office. His education includes a B.S. Chemistry (Auburn University, 1974); M.S. Chemical Engineering (Georgia Institute of Technology, 1977); M.S. Electrical Engineering (California State University - Long Beach, 1990); a Master of Business Administration (University of Oklahoma, 1985); and Juris Doctorate (University of Houston, 1983). He is a member of the Long Beach Bar Association Board of Governors, the Orange County Bar Assoc. and Japan America Society of Southern California.

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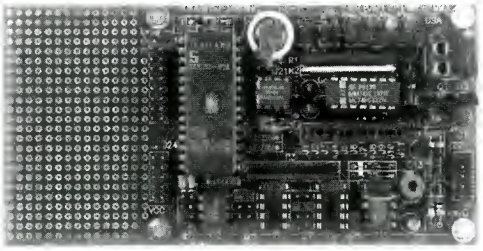

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Patent Pending — A Patent Office Perspective

by Donald Kelly

Hats off to *Midnight Engineering* for dedicating generous space to inventor/author April Lorenzen's series of articles recounting her trials, tribulations, and ultimate success with respect to the U.S. Patent application process. Her (presumably) final installment, entitled ***Patent Pending — Success at Last,*** appeared in the March/April 1994 ME issue. Much of Ms. Lorenzen's saga should provide useful insight for the multitude of inventors and entrepreneurs among ME readership.

Here at the Patent Office (or as Ms. Lorenzen would say, the purveyor of "nit-picky requirements"), we had followed her saga firsthand, unfolding before us in the form of patent applications. Not mentioned in her *Patent Pending* articles were the scenes where the patent examiner and her supervisor repeatedly assisted the inexperienced inventor through a number of lengthy telephone conversations. So, in the end, we were happy to read Ms. Inventor's conclusion: "I am glad I went through the whole process."

Quite admirably, Ms. Lorenzen willingly shares her hard-earned lessons. This is good. It's very important that the legion of creative people who are among the ME readership know more about their American Patent System. In this spirit, permit me to supplement Ms. Lorenzen's views with some general advice from the Patent Office perspective.

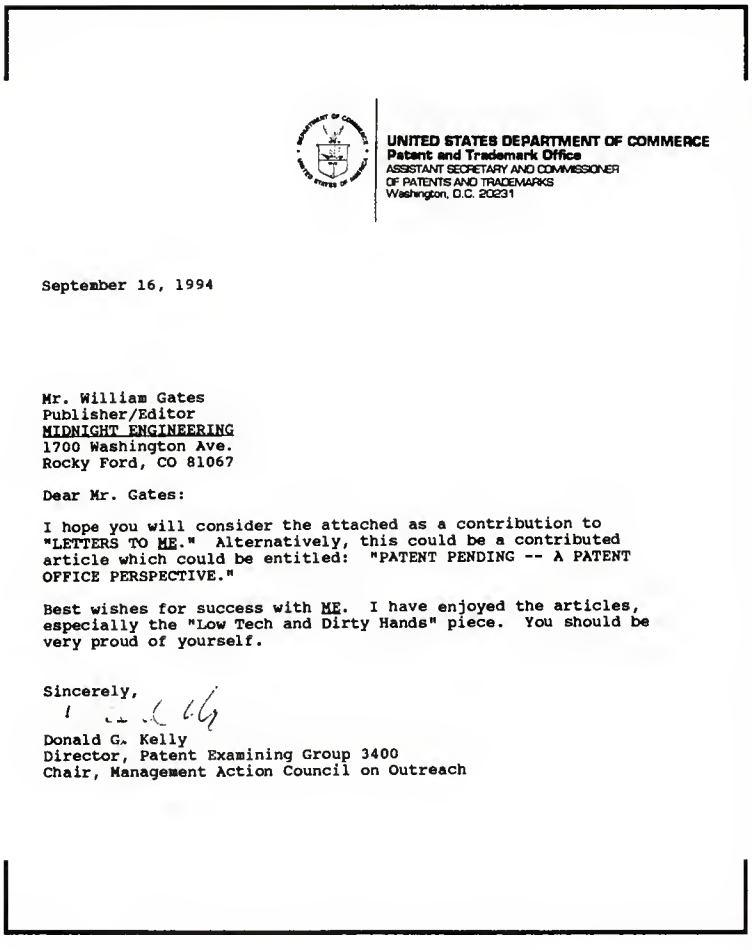
In my outreach efforts on behalf of the Patent Office, I often offer two basic tips to inventors contemplating filing for a U.S. patent grant.

First, the decision to seek a patent should be based principally on economics, not vanity or curiosity, nor for the sheer sake of experience or personal challenge. The process is not inexpensive; it involves what should be a thoughtful business investment framed by a sound business plan. ME readers can find help in making these heavy decisions.

A relatively extensive network of technical assistance providers exists to help with the development of a business plan, and to aid inventors in evaluating the payback potential of such investment decisions. These assistance providers can tell you where and how to perform technical and business research, and where you can find that "helping hand."

For example, I strongly recommend Small Business Development Centers (SBDC's) or University-based Innovation Offices. These, along with a multitude of Patent and Trademark Depository Libraries and local inventor clubs all across America, can provide a wealth of information and friendly, informed assistance. But beware that, along your journey to the marketplace, you are likely to encounter some ruthless highwaymen.

What I am talking about are "Invention Marketing Firms." In all fairness, some of these companies offering services to help boost your idea "out of the garage and onto the market" are considered competent and reliable. But many others are simply, and accurately, characterized as "scams."



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September 16, 1994

Mr. William Gates
Publisher/Editor
MIDNIGHT ENGINEERING
1700 Washington Ave.
Rocky Ford, CO 81067

Dear Mr. Gates:

I hope you will consider the attached as a contribution to "LETTERS TO ME." Alternatively, this could be a contributed article which could be entitled: "PATENT PENDING -- A PATENT OFFICE PERSPECTIVE."

Best wishes for success with ME. I have enjoyed the articles, especially the "Low Tech and Dirty Hands" piece. You should be very proud of yourself.

Sincerely,

Donald G. Kelly
Director, Patent Examining Group 3400
Chair, Management Action Council on Outreach

Scam firms often can be recognized as those asking for sizeable up-front payments (ranging from hundreds to thousands of dollars) for only vaguely promised services, and totally without references to prior successful clientele. Once you have taken the bait, what almost always follows is an impressive-looking, boiler-plated, absolutely glowing evaluation of your unprecedented idea, and (of course) a call for lots more cash. Stay awake! They've become more innovative than the inventors themselves. Don't join the hundreds of thousands of Americans who have fallen for this.

So who are the "good guys?" Your best bet is a marketing assistance service associated with a large university; there are several. Or you might try one of the helpful "not-for- profit" Business Incubators, or any of several other supportive organizations listed in the "Business Service Directory" (available from the Office of Technology Administration, U.S. Department of Commerce, Washington, DC 20230).

As a second tip for ME.readers, (and brace yourself, smart people) I strongly recommend that all patent applicants use the services of a competent patent agent or attorney; there are many. I always implore inventors to do what they do best: "INVENT!"

Clint Eastwood's movie character, Dirty Harry, tosses out a great line in ***Sudden Impact***: "A man's gotta know his limitations." This contemporary homily holds an element of wisdom for each of us. Leave the complex legal work to the "suits." (If you want a listing of registered patent attorneys and agents located in your area of the country, just write to me.)

True, (witness Ms. Lorenzen) you can file for U.S. Patents on your own, and perhaps a thousand or more of our 190,000 annual applicants do just that. It's also true that patent examiners willingly lend a hand in correcting applicants' errors and drafting claims, that is, if it is apparent that a patentable invention has been presented.

But, the resulting claim scope (the definition of the inventor's exclusive rights that flow to the lucky inventor) could be conservative, at best. This is because the competent examiner is ever-mindful of her, or his, duty to those other millions of Americans who will be on the "excluded" end of the exclusive rights equation.

Just as an aside, we all should recognize that a patent examiner's time is precious. You will find them energetically helpful but, also, up to their keyboard-pounding carpi in pending applications and call notes from attorneys and inventors.

Finally, I hope that ***Midnight Engineering*** articles on the U.S. Patent System will stimulate, not discourage, interest in applying for patents on inventions. America needs your inventions. New inventions create jobs, stimulate the economy, and make significant contributions to social well-being of our country.

The Patent Office is dedicated to providing quality service to all customers. If you encounter any problems in this regard, please don't hesitate to call the patent examiner, her/his supervisor, or the Patent Examining Group Director where your application is assigned. We're here to help.

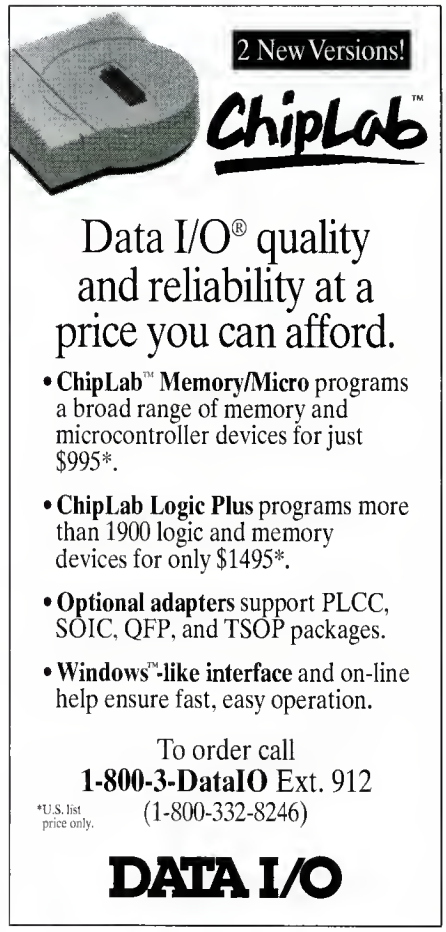
Also, in the coming months, many applications for Federal appointments to patent examiner positions (particularly in the electrical engineering field) will be accepted by the Patent Office (Washington, DC 20231).

It's an incredibly interesting place to work.

ME

Donald Kelly is a Patent Examining Group Director with the U.S. Patent and Trademark Office in Washington, DC 20231. He chairs the Patent Office Management Action Council on Outreach.

My thanks to Don for taking the time to address these points directly. It is refreshing to find honest and revealing information coming from the government. I hear stories all the time about how ME gets into many interesting places and I guess this has got to be one of those places. — *WEG*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maybe ending in some electronic format instead of ink on paper. Usually providing an end product, but with some manufacturing steps partnered with other companies. My role is now increasing more in an advisory capacity in how to make it functional, look pretty, and get it done. Sort of back to engineering — design and implement, not operate.

Give me a call sometime if you want to kick around the subject of engineering and the arts. Or, something hands-on like how to align a re-assembled camera!

D. L. Fuller
Graphics Standard Inc
West Chester, PA

Bill, You Can't Do That!

I'm writing to resubscribe and comment on your *RFPC-1* article. You say that one person could run an operation like GM, and imply that you also know how one person could do the whole thing himself. Being a Tool & Die Maker I've built many machines that put people out of work but kept their company from going under. I know machines are much cheaper than people, but do not see how any one could build cars on a large scale by themself. Just parking that many cars a day is a fulltime job. Then there's oiling all the Robots and let's not even talk about keeping them running. I would like to be proved wrong, and am looking forward to reading your thoughts.

Steve Bromley
Petaluma, CA

[I'll get to the GM problem in good time. My concept is based on integration, mental parallel processing, product redesign and reprioritization as a constant process. Don't knock it if you haven't tried it. I have mastered the process and I like it. I am just starting to seriously scale up the process, so stay tuned. This is the most exciting thing I have ever done and I see no serious limitations. —WEG]

Article Idea

I'm writing to make an address correction on my subscription, and to renew. I have recently moved, and with all the confusion that entails I am just trying to make sure my ME gets to me. I am a video engineer who receives every magazine under the sun. Some are good, some are bad. ME, however, is consistently on the top of my reading list.

I would also like to know if there is an article about a project I worked on a year ago. It involves the world's first FDA approved Stereoscopic Video Medical Endoscope. The project was an effort to produce a marketable product in six months. The product encompassed development in optics, mechanical engineering, industrial design, embedded controller design, and video camera and processing technologies. The team assembled for the project were all consultants and vendors from all over the country (including Carsan Engineering in Denver, CO). The problems and pitfalls that befell the group would make interesting reading. Coordinating the efforts of five separate groups in five different locations proved to be the most time consuming part of the project! If there is any interest, please contact me.

Chris Chaleki
Littleton, MA

[Exactly what I would like to see. Can you write it tonight and modem it to me tomorrow morning?—WEG]

Accounts Receivable Purchasing

In response to the article featured in the July/August issue titled *Learning From Venture Capitalists*, Jack Krupansky failed to mention an alternative source of working capital, namely factoring. In attempting to avoid control-hungry venture capitalists, one should consider the process of selling accounts receivable for cash to an investor (or factor) rather than waiting to collect the money from your customers.

Factoring is a fancy term for a basic concept that has been around for centuries. A receivable, or an invoice which has not yet been paid, has value. It is a debt that your customer has agreed to pay in the near future. Factors are investors that will pay cash now for the right to receive the future payments on your invoices.

Factoring offers a number of benefits to cash starved companies. Instead of having to wait 30, 60, 90 days or longer for payment on a product or service that has already been delivered, a business can factor - or sell - its receivable for cash at a slight discount off the face amount of the invoice. This almost instant cash can be used to meet payroll, fund marketing efforts, or provide working capital.

Factoring can provide the means to a manufacturer to replenish inventory and make more products to sell without having to wait for earlier sales to be paid for. Just about any type of business has the potential to benefit from factoring.

A typical business that extends credit will have 15-20 percent of its annual sales tied up in accounts receivable at any given time. Think about the amount of money that is tied up in 60 days worth of receivables, and then think about what you could do with that cash if you had it on hand.

So how does factoring work? The factor purchases the invoices at a discount, usually a few percentage points less than the face value of the invoice.

Most people consider the discount a cost of doing business. A four percent discount for a thirty day invoice is common. Compared with the problem of not having cash when you need it to operate, that four percent is negligible. Most business just treat it as though they had offered the customer a discount for paying cash. Other companies consider the discount the same way they treat a sale price — it's just the cost of generating cash flow, much like discounting merchandise is the cost of generating sales. Another way to offset the cost of factoring is to take advantage of early payment discounts offered by suppliers.

Factoring is especially appealing to young and rapidly-growing companies. Since the process shortens their busi-

ness cycle, these companies can grow even faster. The inability to make the products to sell while waiting for invoices to be paid is largely eliminated. Such businesses usually net much more profit with factoring than without — even when the discount is considered.

Factoring is an important financing method for small manufacturers because it provides startup and growth capital. A manufacturer needs enough capital to produce those first orders. After that, assuming the customers credit is approved, the factor allows a percentage draw (usually 75-80 percent), against those orders which allows the company to go into its second production cycle.

Finally, loans are largely dependent on the borrower's financial soundness and places debt on your balance sheet. With factoring, funding is dependent on the soundness of your customers (not on yourself) and places cash in the bank.

Although factoring does not replace the need for startup capital, I have often seen it used as an effective tool in funding expansion in the computer and other industries without giving away control of ones company.

ME readers may contact me at 310-474-4989 (voice) or 310-474-9940 (fax) to get more information on factoring.

Bruce Bentel
First Receivable Funding Corp
Los Angeles, CA

Writing For ME Pays Off

I really did enjoy writing a recent article for *Midnight Engineering*. I've gotten a lot of calls from other Midnight Engineers who found it useful, and I've gotten some new ideas and made some new friends.

You know, your RFPC stories really are inspiring. Ever since reading RFPC-2, whenever I'm overwhelmed by the complexity of my software product, I think of you with that Mega-ton web press with the dozens of cut-off, unlabelled wires hanging out. And I don't mean that I think "I don't have it so bad, look at that guy." I mean that I think "if he can have such a complex situation, and enjoy it ('this is going to be one fun toy for me'), then I should remember to look at the fun side of it more often."

I'm looking forward to getting the first ME printed on the new system!

Alan Macy
Responsive Software
Berkeley, CA

International Sales That Work

I must respond to Don Lancaster's column in the July/Aug '94 issue. His experiences with international sales are completely contrary to my own. Dozens of international customers told me they rarely receive mailings from software producers in the United States. They dutifully send in their registration cards, then never hear about updates or receive new catalogs. I saw this as a blatant opportunity. We make a point of sending out catalogs and update notices to every international customer, from Austria to Rongotea, New Zealand. Although air mail postage is more costly, the response has been wonderful. I'd estimate that ten to twenty percent of my gross receipts come from international sales. We see a greater purchasing rate on worldwide sales than domestic sales. We've received many letters over the years that explicitly thank us for keeping in contact with our international customers.

Payment is most often by credit card. I refuse wire transfers unless the customer is willing to pay our banking charge, the pain of which usually helps them find their credit card. If all else fails, they can use an international postal money order.

There are new options for international shipping, too. The Post Office has a service called International Express that's about half the price of other private couriers. For about $20, it delivers a one-pound package almost anywhere in the world in two to three days, twice as fast as air mail and comparable in speed to the other couriers.

I'll second Lancaster's opinions about the benefits of first class mail. Many bulk mail variations do not include change-of-address notification. Saving a few pennies might cause the permanent loss of the address of a cash-generating customer who's simply moved across town. The post office even has a free list-cleaning service that standardizes your mailing list. Call 800-THE-USPS for more information.

It's very important to confirm that a mailing piece conforms with postal regulations. If in doubt, always seek a second opinion at a second post office, even after you've read the regulations yourself. I've had thousands of first-class and air mail pieces held for a minor violation even after I'd showed a sample piece to my post office and had been given the "OK." Once they've rejected a mailing, you can receive a refund of the postage or all your pieces, but not both, unless you scream very loudly. I'll also confirm my satisfaction with United Parcel Service. For any package weighing more than a pound, they're the best way to ship in the United States. I wish they could deliver the mail. We've had insignificant troubles with COD shipments, so I can't imagine why Lancaster has rejected it as a method of payment. Many COD customers are businesses who want to avoid the hassles of purchase orders and invoices that Lancaster correctly describes as a pain in the neck.

There are innumerable ways that dishonest people can cheat you. One source of trouble is shipment without confirmation or receipt. For example, UPS can leave an overnight package on a doorstep in a residential neighborhood without a signature. Or an air mail package to another country might actually arrive, but a cheat will insist it didn't and demand a second shipment. Or a customer anywhere can insist that some of the product wasn't actually in the box they received.

As a maker of software, I worry much more about people who wield their credit card as a mechanism to test drive or even pirate our software. By returning the product to us, the credit card companies will remove the charge

C CODE FOR THE PC

source code, of course

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	TE Editor Developer's Kit for Windows V 4.0 (full screen editor, undo command, word processing; TER for application build-in; no royalties)	$300
	C/C++ Libraries by Code Farms (persistent C structures, ER models, dynamic arrays, database functions, Jolt Award winner; specify C or C++)	$260
	Victor Image Processing Library V3.1 (brightness, contrast, merge images, TIFF/GIF/PCX; color reduction source $395; Windows $550)	$250
	TurboTEX (Release 3.1; HP, PS, dot drivers; CM fonts; LaTEX; MetaFont)	$250
	Crusher! V2.00 (platform-independent data compression for network transfer; beats PK & LH on binary; directory trees; portable C)	$215
	TE Editor Developer's Kit V3.0 (full screen editor, undo command, multiple windows; V3.5 with Word Processing $280)	$190
	COMM-DRV Version 14 (complete interrupt-driven serial communication libraries & device drivers; full source)	$155
	Minix Operating System (Version 1.5; Unix-like operating system, includes manual; specify 5.25" or 3.5" diskettes)	$150
	Delorie GCC for MS-DOS (Version 2.2.2; includes C++, assembler, DOS extender, 387 emulation; complete source code and makefiles)	$150
NEW!	JAKE 3.0 (embeddable natural language processing engine for queries in English to databases, games, help systems, etc.)	$150
	Moby Crypto II (PGP, DES, Secure Hash, UFC, MDs, Crack 4.1, Lucifer, IDEA, VCR+, large integer packs, tutorials, more; not for export)	$150
	Lisp for DOS (Kyoto Common Lisp and CLISP; KCL includes Lisp-to-C translator for building mixed Lisp/C programs, two big manuals)	$140
	Ibrow (Version 4.1; programmer's Windows-based editor; large files, help, undo/redo, drag-n-drop, function & type tags)	$135
Cheaper!	XASM (cross assemblers & utility programs; 65xx, 68xx, 80xx; Intel or Motorola hex format; macro preprocessor)	$125
	ET NeuroKit V3.1 (back error propagation and Kohonen)	$120
NEW!	OSF/Motif 1.2.3 (port of Metrolink OSF/Motif to Linux; single CPU license)	$105
	SCM (portable Scheme in C, IEEE standard, includes JACAL symbolic math package; SCM-4D0/SLIB-1D5/JACAL-1A3)	$100
	PC/IP (CMU/MIT TCP/IP for PCs; Crynwr drivers, NFS server, Bdale mailer, PCRoute/PCBridge, NDIS/ODI drivers, Beholder, more)	$100
Updated!	DA (disassembler for Microsoft's New Executable (NE) binary files including Windows .exe, .drv, .dll, and .flt)	$95
	Script Interpreter (a command script interpreter for DOS-based systems; C-like script language; lots of features)	$90
	CELP 3.2c (Federal Standard 1016 Code Excited Linear Predictive voice sampling and encoding; voice over 4.8kbps; Unix code)	$80
	CPPCOMM V3.0m (C++ serial communications class library for DOS, Windows, OS/2, and NT; includes X/Y/Zmodem)	$75
	Kier DateLib (all kinds of date manipulation; translation, validation, formatting, & arithmetic)	$60
	Coder's Prolog (Version 3.0; inference engine for use with C programs)	$60
	PCCTS Version 1.10 (Purdue Compiler Construction Tool Set; like YACC and LEX together with lots of additional features)	$60
	Container Lite V1.87 (C++ & FLC wrapper emulators; portable, persistent containers of arbitrary data including pointers)	$50
	BigFloat (arbitrary precision floating point arithmetic and functions; includes BCD conversion)	$50
	EZCalc (ASCII algebraic expression evaluator, unlimited parenthesis nesting, symbols, 32 built-in functions, easily extended)	$50
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	Editor Pack (20 public domain editors; micromacs 3.12, Stevie, Elvis, Moke, mg2a, DTE, Jove, Origami, CE & GRIEF)	$50
	DES Encryption & Decryption (2500 bits/second on 4.77 MHz PC for on-the-fly encryption at 2400 baud; not for export)	$40
	Database Pack (9 databases – simple to complex; DOS: isam, bplus, AVL, SDB, ID, gdbm; Unix: Requiem, Ingres89, Postgres)	$35
	COP (poor man's C++; C macro package which implements C++ in C)	$35
	OCT (Object C Translator; essentially Brad Cox's Objective-C Version 4)	$35
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	PERL for MS-DOS (Version 4.019; C, sed, awk, and shell all rolled into one language; includes hardcopy docs)	$25
	GNU RCS (FSF's version of the Revision Control System; like Unix's SCCS only better; keeps track of software development)	$20

Data

	Moby Thesaurus II (6,000 root words, 2.5M synonyms, "common sense", concept related searches)	$500
	Moby Pronunciator II (175,000 words & phrases encoded with full IPA pronunciation & emphasis points)	$265
	Moby Part-of-Speech II (230,000 words and phrases described by prioritized part(s)-of-speech)	$170
	Moby Hyphenator II (185,000 words fully hyphenated/syllabified)	$105
	Moby Words II (610,000 words & phrases with Scrabble(tm) word list, place names, baby names, acronyms, core list for spell checkers)	$100
NEW!	Linux Bible (Everything you ever wanted to know about Linux, 700+ page book)	$40
	CIA World Bank II Database (13MB of maps, 5.7M vectors; coastlines, rivers, political boundaries; 5.25" HD only)	$35
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	The World Digitized (100,000 longitude/latitude of world country boundaries)	$30

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	Prime Time for Unix (Volume 3, No. 1, January, 1994; over 6GB of Unix C code)	$60
	Walnut Creek Libris Britannia (over 600MB of the best of British boards; not all source included)	$50
	Walnut Creek C User's Group (Volumes 100 to 364)	$40
Updated!	Plug-and-Play Linux by Yggdrasil Computing Version 1.1 (run from the CD; TCP/IP & NFS; drivers; MPEG; SCSI support; lots more)	$35
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John Foust
Syndesis Corporation
Jefferson, WI

Obvious After You Hear About It

I just read your *RFPC -1*, and I found it not only totally sensible, but, like all great ideas, obvious (after you hear and understand it). Another model is that of the Craft person: I think many of us have a need to really immerse ourselves in that which we create, and to DO IT ALL. How else can one really experience what one is doing? Anyway, you are making a really valuable contribution to my life, and, I'm sure, to the lives of many others with your magazine, and, more importantly, with your example.

Ken Turner
Ramey, Puerto Rico

Unintended Renewal

I have enclosed my renewal for *Midnight Engineering* for 3 more years. I had fully intended to let the subscription expire without renewal. However, the July/August issue caused me to change my mind. After many issues of enjoyable but not applicable information, this issue zeroed in on many of my interests and several of my future plans. I am usually delighted when I find something in a magazine that seems to be addressed to me, but positively overjoyed when almost every article has a major significance.

I am not expecting every issue to be directed at me, but I already feel I have "GOTTEN MY MONEYS WORTH."

Thanks for your leading by example in a brand of business "Self Sufficiency" that excites me and draws me into new challenges. Keep up the good work and keep us filled in on the details of what you are doing. Seeing someone testing their new ideas and learning from the experience with them is most valuable. LIFE IS TOO SHORT TO MAKE ALL THE MISTAKES YOURSELF.

Lany Mccubbin
San Antonio, TX

—ME

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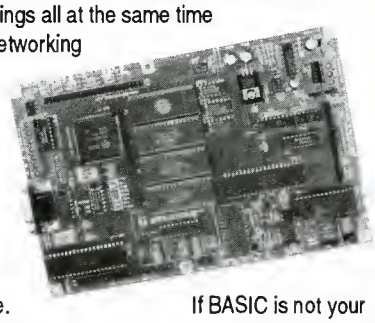

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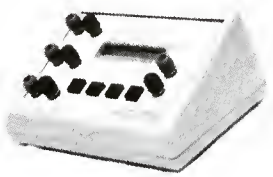

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Reader Service Number 143

Entrepreneur On The Move

by Jack Krupansky

In Search of Entrepreneurial Utopia

Everybody seems to be yearning to live in small towns where they can be surrounded by friendly neighbors and revel in quality of life. Away from the rat race, away from crime, and away from bad karma. Technology can make it happen. The construction of the information super-highway should clinch the deal. So why am I moving to New York City? Good question. Maybe it's the part of me that hates to mindlessly follow trends. Maybe it's because I'm a problem solver and NY seems to be nothing but problems. The real answer is more complicated. I haven't moved yet and I haven't worked out the logistics, but Bill thinks it would make a better story to start with my expectations and later follow up with the "real" story of how it all turns out.

I hesitate to tell people about my move. It seems like a step backwards. The range of responses is quite entertaining, ranging from "Are you crazy?" and a worried "Why?" to "Cool!" and "I'm jealous." If I moved anywhere else in the country I would get moderate responses and polite queries as to my reasons. But moving to NY requires some real explaining.

So why am I moving to New York City? Good question. Maybe it's the part of me that hates to mindlessly follow trends.

The simple reason for my move is that my current work situation allows me to live where I want and I've wanted to live in NY for some time. Boulder, Colorado is a nice place, but after twelve years, it just doesn't inspire me anymore. I don't plan to live in NY for the rest of my life, but it seems like it would be a good experience. I grew up in New Jersey and was always in awe of NY. I've been visiting NY twice a year for some time now and haven't gotten tired of it. I don't know of any city as exciting as NY. Paris, Hong Kong, London, and Tokyo have a lot to offer, but NY is something else. If you can get past all the grunginess and density, there is never a dull moment. I do like restaurants and no place can compete with the sheer variety in NY. I'll be able to haggle

face-to-face with the sales guys at J&R Computer. They're always filming movies (the latest *Batman* and *Die Hard* during my last trip.) Travel to Europe is faster and cheaper from NY. NY is also midway between Boston and Washington which are two of my other favorite destinations and the thought of easily traveling between those three cities without the hassle of airlines has some appeal.

Now that I've told you WHY I'm moving to NY, here is my rationalization for why it really is a good idea (for me)... There is a lot of business potential in NY. In no other place is there anything close to the concentration of big businesses that spend giga-bucks on technology. Even before moving I've arranged to do some Windows NT consulting for a Wall Street firm at a fairly decent hourly rate. My new software product will appeal to large companies developing custom software applications and the density in NY will allow me to mail and phone prospects at very low cost. I can even make "house calls" to give demos, look at problems, and see how my product is being used. The large number of software consulting firms in NY might also provide significant business opportunities. There are also a lot of trade shows in NY (and Boston and Washington.)

I could work at home, but I do like working in a separate office. I expect to share an office in midtown Manhattan with a sales guy from my current consulting client (he'll supposedly spend most of his time out visiting customers). I don't really want to go with a shared-service business center which is expensive (but plush) and forces you to use their phone system and marked up cost of long distance phone calls, but the only other alternative for a comfortable small office is to sublet in someone else's office. It looks like I can get a top-notch answering service for under $80 with nominal rates for features such as FAX-back. Business centers offer intangible benefits such as business networking, which can lead to valuable business contacts. Working alone at home can drive you crazy. Being surrounded by other business people can focus your attention on the here and now of business. One business center had quite a few high- tech clients who use the center for satellite sales offices.

Apartments are expensive, but I think that's just a little test to see if you REALLY want to live in NY. I expect that I'll be able to get a really nice studio apartment for $850 to $1200. Given the heat and humidity of summer in NY (and the noise and general chaos all the time), I think that a few hundred dollars a month more for a comfortable, cool, and quiet apartment will be worth it and necessary to maintain (or achieve) my sanity. Restaurants are expensive, but the good stuff like bagels, corn muffins, and pizza are actually cheaper than in Boulder! My better consulting rate in NY should cover the increase in living expenses.

I expect to have my FAX and voice phone lines forwarded to my new numbers for awhile. The nice thing about my 800 number is that it can easily be redirected to my new number at no charge.

I'm thinking about establishing contacts with the NY venture capital community to see if I can do some consulting for them (e.g., due diligence, working with software companies). I think my *Midnight Engineering* VC article might come in

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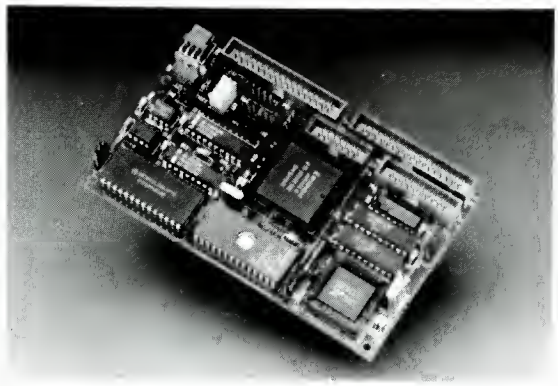

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handy. I'm thinking about expanding the article and turning it into a pamphlet. I may not be able to make money off it, but it could lead to something bigger.

I plan on doing more writing of technical and business articles. My experience with multimedia may also spawn some opportunities in NY. I'd like to see what NY college students are being taught about multimedia (or what I can teach them).

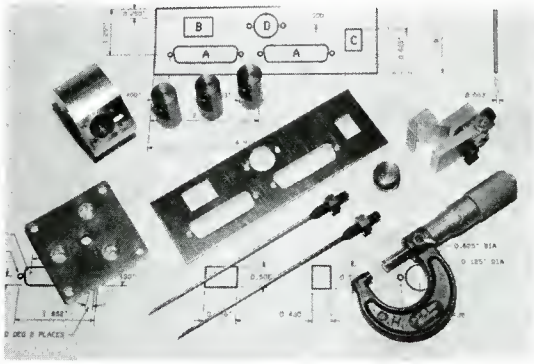
The bottom line is that NY is quite inspiring and that's what I need. Sure, I'm self-motivated, but immersing myself in a sea of problems will focus me on dreaming up solutions to real problems. Business in NY is not exactly a cakewalk, but if I can't survive there then what kind of two-bit entrepreneur am I anyway?

Maybe I'll come to my senses and not move. Or move and then move again. Or give up on my business. Or become an op-ed columnist for *The New York Times*. We'll see. In a few months I'll have some sort of story to tell or some real explaining to do.

ME

Jack Krupansky runs a one person software business, Base Technology, which develops and markets the Liana object-oriented programming language and offers Windows software development consulting. He may be reached at 303-440-4558, Fax at 303-444-4186, or e-mail at 70642,2662 on CompuServe.

Metal Work



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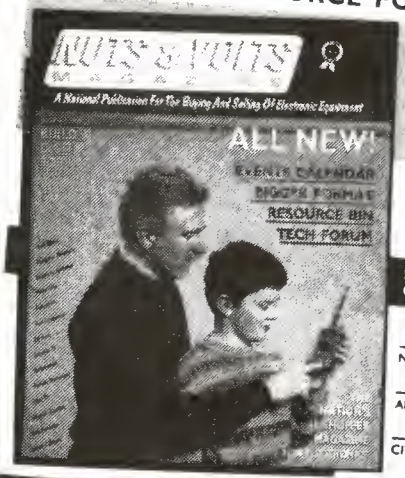

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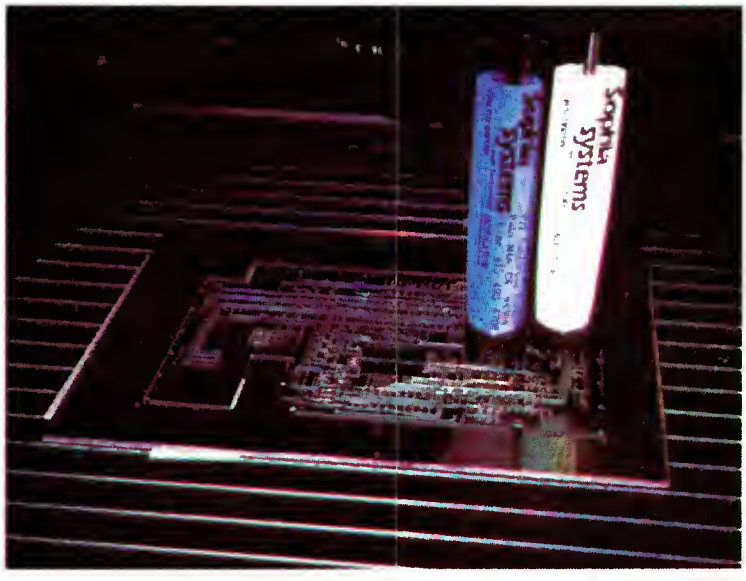
Embedded Systems Conference

by Bruce Boyes

Santa Clara,CA September 20-23, 1994. Introductory speaker Mike Flynn described the 6th annual Embedded Systems Conference as "a place where we are surrounded by people who understand what the heck it is we do." This year, we were surrounded by over 5000 such people.

Miller-Freeman (publisher of ***Embedded Systems Programming*** magazine) owns and produces the conference and claims that it is the largest exhibit of embedded products. True though that may be, this is a tiny gathering compared to shows such as Comdex. Embedded systems are used daily by hundreds of millions of people but created by a relative handful. Embedded system tools are generally purchased by system designers and programmers rather than end users. This is a radically different market from personal computers where every end user is a potential customer for multiple software and hardware products.

Attendance was a record 5158 for exhibits only, 719 for the conference. This compares to 1993's figures of 5011 and 536, respectively. Of the 90 conference technical lectures, thirteen were related to fuzzy logic! Networks and debugging techniques were almost as popular. 153 vendors expanded this year's exhibits to fill the entire Santa Clara Convention Center hall. Single board computers were more prominent than previous years, due to an alliance with the VITA (VMEBus) and PC104 (embedded PC) trade associations.



Financial Conjecture

I've often wondered how a conference of this scope comes together financially. Miller-Freeman doesn't release such information, but we can make some guesses based on attendance figures. Exhibition attendance is free to those who register in advance and $25 at the door. The conference lectures and workshops cost $795. Multiply this by 719 attendees and you have a gross conference income of over $570,000. A standard booth is 10x10 feet, with a cost of $2395. This year, Miller-Freeman rented 314 booths (many of the vendors rented clusters of two or more). This equates to a total of $750,000 for booth rental.

The grand total for estimated gross income I would guesstimate to be $1,100,000. Clearly, putting on a show of this size is a major undertaking and requires significant capital. Imagine the risk of putting on a new conference and not having enough attendance to cover your expenses! Miller-Freeman puts a lot of effort into high-quality promotion and advertising. There are other significant expenses: printing 5000 copies of the 500-page proceedings and conference program, renting and furnishing the hall, speaker honorariums, refreshment catering (some of which is vendor-sponsored), and general staffing.

The Embedded Systems Conference is one of the smaller and more comfortable conferences I've attended. Registration, transportation, security, catering and the other services all seem to run smoothly and efficiently. Most companies exhibiting are relatively small, so you are likely to meet the president, chief engineer, and national sales managers in the booth — I like that!

I Came, I Saw, I Schmoozed

This year I attended for the entire week and still didn't have enough time to investigate every interesting technology. Any of us who have staffed a trade show booth know that it's surprisingly tiring being on your feet all day and talking non-stop. By the end of the week I was suffering from new

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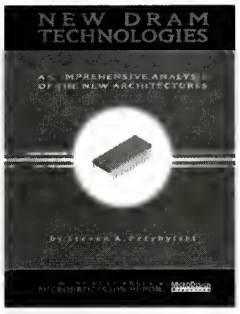

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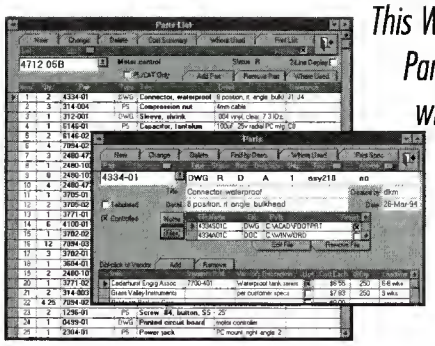

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Information Overload

information overload (NIO). I spent the weekend with a friend visiting the coast around Half Moon Bay. A couple of days staring at the ocean and watching seals body surf was a welcome change from a week's barrage of high-technology jargon.

Slighted by Philips

Philips announced a new souped-up 8051 processor. To celebrate, they chartered a DC-3 and took members of the press for a cruise around San Francisco Bay. In spite of the fact that my company wrote and sells a BASIC cross-compiler for the 8051, and I was at the show as an official member of the press, I was not invited (sniff). A large number of *Midnight Engineering* readers are 8051 users, but evidently ME just doesn't rate on Philips' short list.

Best Party

For the third year in a row, Wednesday's barbecue showed that Motorola still knows how to throw a party better then anyone. The initial entry line was long, but during the wait you were treated to beer or soft drinks (see the photo of one of the Motorola waiter) and live music. The featured band was none other than grammy award-winning *Asleep at The Wheel*, imported all the way from the lone star state. Motorola erected a huge tent in an adjacent parking lot and provided ribs, chicken and brisket with all the fixin's. There was a whole truckload of cold domestic beer on tap plus buckets of Texas microbrewery bottles on each table. You've got to admire this kind of class.

Intel's Oktoberfest Tuesday night was held on the show floor. There was more than enough micro brewery beer. This year, food was more plentiful and served from enough places that lines were only a couple of minutes long. There was essentially no seating once you had your food, though.

Thursday's "beach party" by AMD ran out of appetizers early, after many had waited patiently in line for twenty minutes or longer. Beer and wine held out longer and the band was really quite good. Just before I called it a night one of the attendees, obviously feeling no pain, climbed up on stage and sang "I can't get no satisfaction."

Long Live the 8051

It looks like the 8051, over 350 million of which have been shipped, will live on at least another decade. Dallas Semiconductor (214-450-0448) led the way last year with their revved-up 80C320. It is a redesigned 8-bit 8051 core which runs 2-3x faster than normal, plus added peripherals. Dallas is best known for their nonvolatile memory products and 8051 soft microcontrollers. Upstart Dallas beat the big boys to the enhanced 8051 market by almost 2 years!

Intel and Philips have yet to catch up, but not for lack of trying. Over a year ago, Intel and Philips announced the joint venture which was to produce the 8051ZX super chip. After much hoopla the alliance fell apart and the part vaporized. Now Intel and Philips are each independently announcing new vaporchips which will rise from the ashes of the 8051ZX.

Intel's new "251" architecture offers 16 bit math, more stack space & registers and claims to run 5x to 15x faster. Philips announced their own 80C51XA, claiming 10x faster performance. Both vendors claim source code compatibility with the generic 8051, although new code is required to realize the full boost in performance. First silicon of both parts is scheduled for 1Q95.

8051 Programming Tools

Franklin demonstrated a $795 Windows program called Driveway. This nifty utility generates 8051 startup and interrupt handler code. It requires manually clicking on icons for all the 8051 peripherals which you want to control (UART, interrupt controller, timers, etc), but you just pull down menus to set parameters such as baud rate. The software then generates a C function to configure the 8051 to conform to your wishes.

Production Languages Corp expects to be the first 8-bit tool vendor with Plum Hall validation. As a show special, you can buy their C development system for $495. It is a true Windows tool suite.

Metalink ICEMaster PE

Metalink (602-963-7373) believes their low-cost (starting at $851) ICEMaster PE to be largest selling in-circuit emulator (ICE) ever in terms of units sold. Metalink's patented technol-

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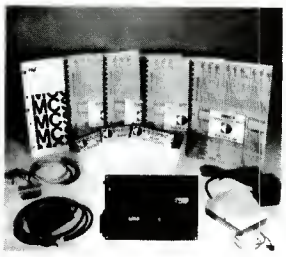

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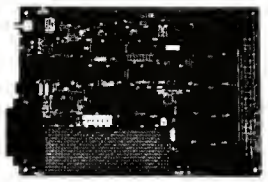

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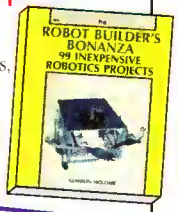

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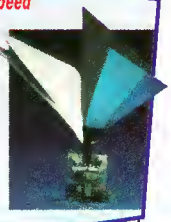

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ogy reduces complexity, component count, and cost. Announced at the show was a new ICEMaster PE for the Dallas 80C520 and 80C530. Nohau (408-866-1820) has had Dallas emulators for some time, but the Metalink model is about half the price of the Nohau.

Most Unique Software Technology

This award clearly belongs to LogPoint Technologies Soft Coprocessors. This unique software uses a logarithmic algorithm as the basis of a newly patented floating point math library. In many cases these algorithms execute more quickly than hardware coprocessors! For example, the algorithms are faster than a 486 FPU in every function except add and subtract, and are particularly effective on transcendental functions. If implemented in hardware, these algorithms could be 100x faster than current floating point coprocessors!

Yes, there is a tradeoff. The data is not stored in the accepted IEEE754 format. LogPoint may propose a new C data format perhaps "efloat" which handles data in the native LogPoint format. They are talking with commercial compiler writers now about adding this as a new data type. Their algorithms don't tolerate compiler optimization as other C code does, so this is one compiler issue they need to work out.

The present product only handles a 32-bit data word and can be expanded to 48 bits, but becomes slower at 64 bits. The algorithm uses table lookups. Higher precision requires larger tables which have longer lookup times so it is currently not competitive at 64 bits. Contact LogPoint at 415-967- 3974. It's exciting to see something this new in an area which we assume has been fully explored.

Pocket-size Logic Analyzer

Boulder Creek Engineering (408-338-3907) introduced the Pod-A-Lyzer, a 3 x 1 x 1 inch, 18-channel, 100 MHz logic analyzer for about $1300. It plugs into a PC's serial port and features a Windows-based software package to display wave forms. Boulder Creek may make available an application programming interface so that you could paste analyzer data into your own code, or a spreadsheet or database.

Take one of the new Fluke portable digital 'scopes, a Pod-A-Lyzer, an ICE-Master-PE, and a laptop PC and you've got some sophisticated debugging tools which all fit in a briefcase. I'm hoping to have a detailed review of the Pod-A-Lyzer in the next *Midnight Engineering*.

Circuit Writer

The accompanying photo shows what looks like an X-Y plotter with small tubes of caulk mounted on it. This is an intriguing new product which draws circuit board traces directly on a substrate. The company started in 1986 as Ariel, and is now owned by Sophia

Systems. The system lays down a UV curable silver loaded epoxy 10 mils wide. The conductive trace is partially cured with UV light, then the path is retraced with an insulator (a similar epoxy without silver). This insulating trace is then partially cured with UV light. Traces can cross over each other once.

Sophia is a Japanese company and the Circuit Writer is currently only being sold in Japan. The ESC was its first public showing in the USA. Call Sophia at 415-493-6700.

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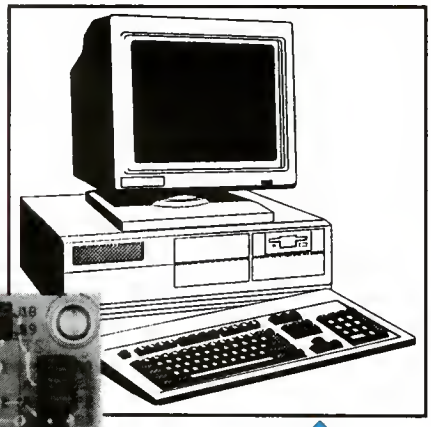

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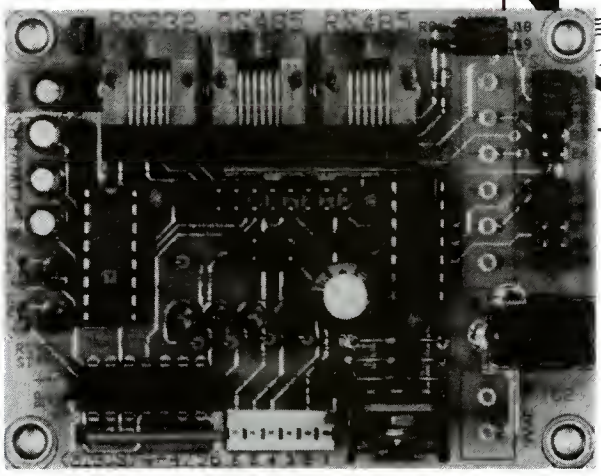

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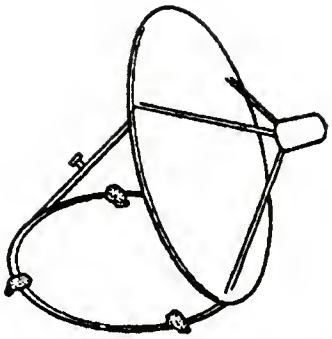

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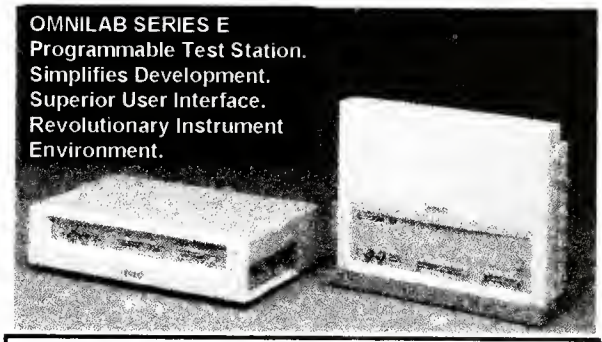

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Information Overload

Circuit Writer uses special gold flashed PC board stock. Total consumables are $600 for a 6x8 inch board, which takes a few hours to complete. The finished board is given an overall UV cure and can then be wave soldered and IR reflowed. Circuit density is roughly equivalent to 4 or 6 layers or an uncrowded 8 layer board. Sophia claims that signal integrity is typically better than a conventional multilayer PC board.

According to Sophia's analysis, if a service bureau could do one board a day (250 per year) it makes sense to own a Circuit Writer.

ACCESS.BUS

ACCESS.BUS (a superset of the Philips IC bus) was adopted by VESA in August of 1994, and is a proposed component of the Intel and Microsoft Plug & Play initiative, but is not officially adopted yet. The ACCESS.BUS trade group has 50 plus members. IC has 65% of the world market for connecting ICs serially. ACCESS.BUS was conceived by Philips and DEC to connect multiple I/O devices on a single communications port.

ACCESS.BUS supports up to 125 devices on the same bus. The data rate of 100 kbps is about 80 kbps net after deducting overhead. ACCESS.BUS supports hot plugging and multiple devices of the same type (multiple mice or keyboards for example). It uses a simple four wire interface, and low-cost coax or twisted pair wire. Wireless RF of less than 20 feet is under development, using 27.12 MHz carrier. The specification provides for drivers capable of 500 mA into an 800pF load with a 10 meter cable length, but systems can use repeaters. Each data packet is 4-128 bytes long, so the standard is optimized for control, not large file transfers.

Embedded Power PC

Guess how many embedded Power PC systems are shipping today? Zero. Nada. This was a shock to me. Although the embedded Power PC was announced at last year's ESC, the IBM Power PC 403GA chip has only been available for a few weeks.

The chip is under $50 in lots of 1000. An evaluation board is $2100. All of IBM's Power PC development tools are RS6000 hosted, none are MS-Windows hosted (but other 3rd party tools may be). The IBM Visual Simulator (not a Windows program!) does 100K instructions per second on an RS6000 system.

First BIOS for Embedded 386EX

Dan de Lano, General Software's "Product Evangelist" (that's the title on his business card) talked with me about their release of the first BIOS for the new Intel embedded 386EX processor. They have combined a real time kernel and their version of DOS 3.31. This is much better for real time control than a simple non-deterministic "embedded DOS". They have some features of DOS 6.2 such as 6.2 FATs.

We got to talking about what would be really new in the world of debuggers. Dan offered the idea of a multi-tasking aware debugger. Such a debugger might have an automatically

generated window for each task. The task window would show the current status of all variables local to that task. Each task window would also display that task's view of global variables, especially resources shared with one or more other tasks. This would help debug inter-task communication. Does anyone know of such a product?

Microchip

Microchip (602-786-7200) has hardware support for the IC bus in their mid-range 16C64 and 16C74 8-bit RISC controllers. Microchip is now #8 in world units of microcontroller shipments, up from #23 three years ago. Microchip now has $120M in annual sales. Fortune magazine considered Microchip the best Initial Public Offering (IPO) of 1993.

The new 16C74 RISC controller offers a lot for a $6 (1000 piece) part: 8-channel, 8-bit ADC, EPROM, RAM, USART, two PWM outputs, and more. Microchip has optimized some of their PIC controllers for specific tasks such as fractional horsepower AC motor control, battery management, and mouse and trackball control.

Parallax

Parallax's BASIC Stamp has been a hit. Parallax is selling bunches of BASIC Stamp developer kits in addition to volumes of the stamps. Parallax is doubling in revenues every year.

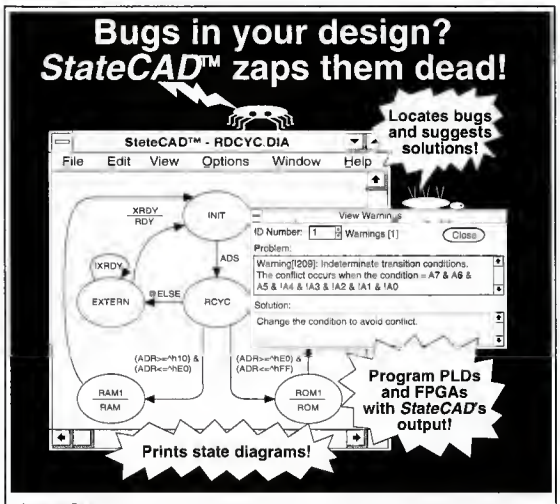
Chip Gracey, Parallax Vice-President, has spent a year working on a simple algorithm for vocal tract modeling on a PIC microcontroller. This will be the basis of a forthcoming PIC speech synthesizer of unlimited vocabulary. Call Parallax at 916-624-8333 and see the photo for a picture of Parallax's executives: Chip and President Lance Walley.

Visual Object-Oriented Fuzzy Windows

These were the hot buzzwords this year. Imagine a product incorporating them all... it could be the next embedded "killer app." But set aside all the hype and what do you find under the hood?

What you see ain't always what you get. All across the exhibit hall, development tool user interfaces evidenced the rush to jump on the "windows" and "visual" bandwagons. However, many of the so-called windows tools are warmed over DOS versions without true Windows features. Some are just windows shells which invoke underlying DOS programs. Why? Creating a sophisticated windows program is a formidable task. Writing simple Windows programs is not so hard as evidenced by the power of Visual BASIC. Becoming proficient at advanced Windows programming takes at least a year, according to those who've done it. Windows itself continues to evolve, so at times learning it is chasing a moving target.

There is general agreement among programmers that object oriented techniques have yet to penetrate many existing markets. For example, how many recent network protocols are inherently object oriented? According to Jim Butler of Cimetrics, the new BACNET protocol is the first he's seen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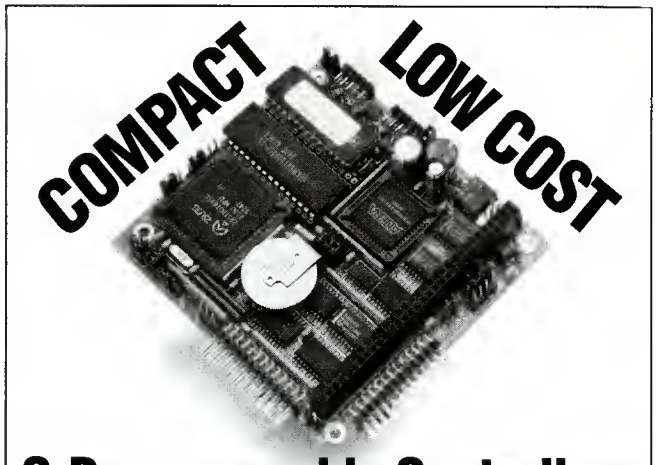

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On the other hand, fuzzy logic has quickly made a major impact. It is real and here to stay. Fuzzy logic has already improved a number of mainstream applications such as automotive transmissions and braking systems.

Hartstones

Tim Martin of DEC lectured about the subtleties of benchmarking embedded systems. Toward this end, the Hartstone is a new embedded system benchmark aid. Information is available on the Internet. Hartstones attempt to measure the effect of such factors as interrupts and a combination of harmonic and non-harmonic loads. For more information, e-mail to tim.martin@mro.mts.dec.com or try him at tmartin@helix.enet.dec.com, or check in with the Systronix BBS at 801-487-2778. I will post Hartstone files on the Systronix BBS as soon as possible.

Sack Sitter

Sack Sitter is a relatively new franchise which ships literature back to your home from a trade show. You just drop off your armload of literature at their booth and they'll box it up and ship it to your office, for a modest fee. What a great idea — why didn't I think of that?

Software Based on Evolutionary Delivery Plans

Bob Podd of Software Results Inc (508-877-4311) is applying fast-track development principals to the creation of software. Evolutionary software development organizes a project as a series of incremental steps and associated reviews. This creates a series of tests as the project goes on, rather than leaving testing all to the time of final integration.

If you are building a house of cards you want it to collapse early, not the week before the scheduled ship date. You want to discover you're in trouble when you still have time to do something about it. Bob advocates concentrating on the 20% of the software that meets 80% of the customer needs. Leave additional features for a future release.

If the first increment is late, that gives you a chance to recalibrate your estimates early on. If an increment is late, then you can make the decision to cut features on subsequent increments to meet the overall delivery date.

Commitment is a process of 1) spending money to acquire tools, 2) devoting time to the project, 3) accepting and dealing with risk, 4) surviving failure (not defeat), and 5) changing the process and repeating until you succeed.

Windows Technology Report

I took my trusty HP95 palmtop to the conference and entered the basis for this article on the spot. Back home, I pulled the file into WordPerfect 6.0a for Windows. Incidentally, this is the first *Midnight Engineering* article I've written in Windows instead of DOS. I'm finally addicted to the Windows editing keys, mouse-driven text blocking, and more powerful spell checker and thesaurus.

We've been using a variety of Windows programs at Systronix for almost two years. But for editing large amounts of raw text I still frequently prefer WordPerfect 5.1 for DOS. I can hear some of you gasping and shaking your heads in amazement — yes, it uses clunky and awkward key assignments but I'm used to them and can make 5.1 do almost anything. But I'm being spoiled by Windows multi-tasking and the benefits of WYSIWYG on my 17-inch Nanao 550i monitor.

I work at my screen for hours at a time, and find that for CAD and desktop publishing, 1024x768 at 70 Hz on a 17-inch monitor provides a reasonably comfortable view. In my experience a 486 DX2-66 with 16 Mbytes of RAM and a 425 Mbyte hard disk is the minimally acceptable configuration if you make your living using a PC. I just upgraded from a 486DX-33 with 8 Mbytes of RAM and a 200 Mbyte disk, and the performance boost is significant. DOS 6.2 and Windows 3.11 are worth the upgrade from DOS 5.0 and any previous version of Windows. DOS 6.2 makes much more efficient use of high memory and Windows 3.11 is more robust.

Bruce in Wonderland

Speaking of hard disks, Fry's Electronics was advertising a 540 Mbyte Maxtor IDE disk for $229. This was almost too good to be true, so I stopped in at the San Jose store to pick one up. This was the first time I'd been in a Fry's. It was almost unbelievable — a store the size of an average K-Mart, filled with every imaginable type of personal computer hardware and software at discount prices. I wandered up and down the isles in a daze, barely resisting the urge to load a shopping cart with one of everything. There was no catch on the drive deal — it's now installed and working fine. What a country!

Excuse a bit of nostalgia: the first hard drive I ever bought is still in use on the Systronix BBS computer (801-487-2778). It's a 30 Mbyte full-height 5-inch Seagate, a $700 good deal nine years ago. The new Maxtor provides 18 times the storage at 1/3 the price, in a package 1/4 the size. At this rate by the year 2000 Fry's will be selling 1.8" 7 Gbyte disks for $100 and our PCs will have 256 Mbytes of RAM.

ME

Bruce Boyes can be reached at Systronix, Inc., 555 South 300 East #21, Salt Lake City, UT 84111, 801-534-1017 or fax: 801-534-1019 or BBS: 801-487-2778.

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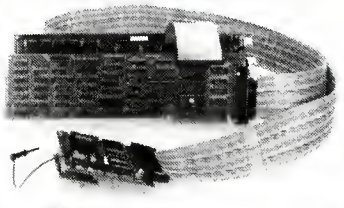

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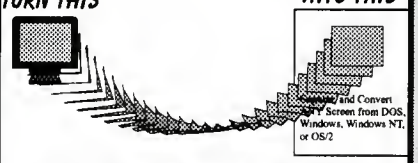

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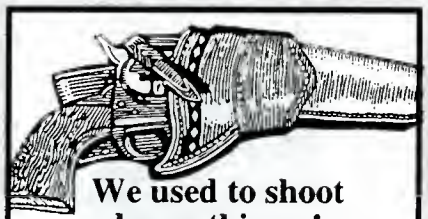

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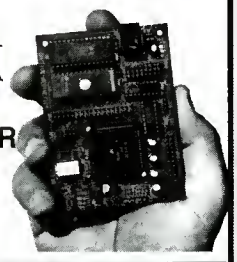

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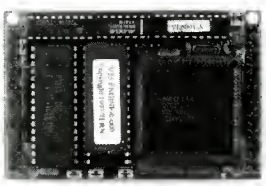

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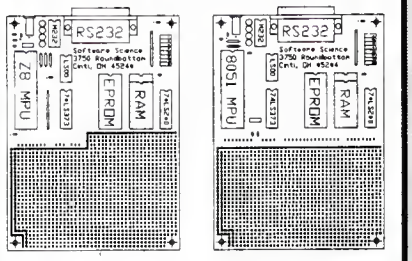

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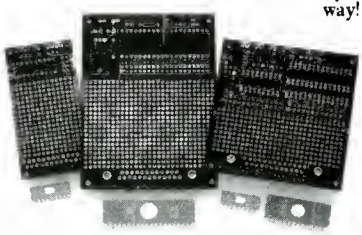

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by Don Lancaster

$99 Flutterwumpers

I sure do receive bunches of helpline calls asking for an automated XY table that costs $99 or less. Since this is so simple and easy to do, I'm amazed that no *Midnight Engineer* has yet picked up on all the utterly incredible opportunities here.

I'll define a *flutterwumper* as any eminently hackable entity that moves and then either chomps or spits. A few horribly restrictive examples include...

- Printed circuit drills
- Animation stands
- Santa Claus machines
- CAD/CAM mills
- Paint detailing robots
- Pick-and-place positioners
- Programmable sign routers
- Waterknife cloth shaping
- Embroidery customizers
- Automated weaving looms
- Vinyl lettering cutters
- Jewelry lost wax formers
- Silk screen master makers
- Precision laser shapers
- Award engraving systems
- Cake or pizza decorators
- Spark discharge EDM

But the concept of *intrinsic flutterwumptocity* clearly transcends all of these. If, instead, you go back to the basics and attack the *generic* system fundamentals using the latest of new concepts, tools, and products, then all sorts of $99 flutterwumper solutions become painfully obvious. Opportunities that are going begging.

Let's look at some secret insider first principles of low cost flutterwumping...

Don't Sweat the Mechanics

The mechanical part of any flutterwumper is the *least* of your worries. Instead, you should tightly focus on a generic *system* of sofware, firmware, hardware, and drivers that can form the *absolute minimum* interface and control core for most *any* flutterwumper.

One that is workable with *any* choice of mechanical goodies. Of any size.

In what follows, we'll assume a 2-1/2 D flutterwumper where you want full independent motion along apparent X and Y axes, but only a simple "up-down" or "on-off" action along your Z axis.

No Gantries Need Apply

The classic XYZ gantry is just about the *worst* possible way to build a flutterwumper. *Avoid gantries at all costs!* For X has to support both Y and Z. And Y in turn has to support Z. Just like a multi-stage rocket, you need tons of machine to support ounces of payload. And your position inaccuracies are *certain* to pile up. So are your costs.

One early "semi-gantry" workaround was known as the *H system*. This worked sorta like those old parallel rule mechanism drafting tables. Two steppers sit stationary at the bottom of the H, both driving a convoluted belt. The *differential* stepper motions set X and Y positions.

If the steppers both twist in the *same* direction, you get X motion. If the steppers twist in *opposite* directions, you get Y axis motion. See the July 11, 1994 *Machine Design* for the latest reincarnation of this ancient ploy.

Divide and Conquer is a useful anti-gantry technique. Move the chomper in the X direction with one system. And move the work in the Y direction using a second system. Nicely converting a complex 2-1/2 D problem into a pair of vastly simpler 1 D and 1-1/2 D ones.

But your best way around a gantry is to *forget about Cartesian co-ordinates entirely!* Any old brain dead micro can instantly convert between reference systems. True XYZ is often a totally unneeded waste. As long as you have at least three degrees of freedom, you can fake XYZ.

Ferinstance, two pivoting linear steppers that share a common shaft slider can hit any X-Y point.

Many robots use a cylindrical co-ordinate system. Made from a rotating base and a doubly hinged arm. Nothing slides. One stepper twists for base orientation. A second twists for arm elevation; a third for upper hinge angle.

Even more elegant is a revolutionary new *virtual ways* system. Described in the August 15, 1994 issue of *Design News*. Take a base plate and place six ballscrews or linear steppers uniformly around a large circle on it. Now lean each ballscrew by 45 degrees or so and attach them all to a smaller upper head plate. The head plate can easily assume all of the normal lathe or mill motions. But *there are no precision sliding contacts anywhere!* All bearings are plain old round ones. All forces are pure tension or compression with *zero* side loadings.

Minimize Chomper Load

The less you've got to shove around, the cheaper and simpler your flutterwumper. The two usual loads on your chomper head are *side loading* and *chomper mass*.

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Automated XY Table

Side loading comes about from reactions against the work being machined. Two heavy side loading examples include rotary mills and wood routers. Especially if your tools are not kept ultra sharp. Tool speeds and feed rates also get into the act. Printed circuit drills and waterknives have considerably less side loading. Zero or near-zero side loading can result with laser cutters or inkjet heads.

If possible, try and use a flutterwumper chomper having minimum side loading. Then carefully select your tool choices, sharpness, and feed rates for further reductions. Any super-cheap solution can run real slow, saved by that good old "Uh, compared to what?" factor.

The heavier your chomper, the worse the problems when you try to shove it around. See if you can't find creative alternatives to *move only what really needs moved.*

Ferinstance, instead of shoving an entire router motor around, can you support the motor high up and use a rotary shaft instead? Better yet, can you go pneumatic and use a tiny air motor and a very flexible supply hose or two? Can you make it self-advance on some sort of a Bendix? The *OralSafe* dental supply offers a $13 *disposable handpiece.* This gem is easily cut down to form a tiny air turbine the size and mass of a plotter pen.

On a laser cutter, mount the laser solidly on the *side* of the flutterwumper frame and then use mirrors to deliver the beam energy to the chomper head. For minimum mirror problems, use large and defocused delivery beams.

Regardless of your flutterwumper goals, spend lots of time and thought minimizing your chomper head mass and side loadings. Ask yourself what the absolute minimum work action is needed.

And then deliver it. As baggage-free as you can.

Car Alternator Steppers?

There's two choices in flutterwumper motion controls: *open loop* or *closed loop*. When in open loop, you tell the flutterwumper where to go and hope it gets there. Often using digital *stepping* motors that move in discrete chunks. Positioning errors may pile up due to backlash, calibration accuracy, or tool wear. In closed loop, you continuously measure where you are, derive an error signal and then you force motions closer to your desired position. Often using analog *servo* motors that seek out a low error.

Closed loop is usually more expensive and complex. It also can be gross overkill. If you do go closed loop, note that *PCIM* is a good magazine here, that *Hewlett Packard* makes position encoders, and that a new technology called *binary chain codes* has big advantages over those Gray encoders. See HACK80.PS for details.

Except for its ludicrous cost, the *Hurst* SLS is a dandy linear stepper. Twenty pounds of force in four mil steps.

Useful hacker sources for steppers and such include *American Science & Surplus*, *C&H Sales*, *Herbach and Rademan*, *Fair Radio Sales*, *Burden's Surplus Center* or *AST Servo Systems*. But big steppers are kinda pricey.

Can car alternators be used as power steppers? The amazing answer is that they can. They are ultra cheap and deliver an amazing amount of kick. The secrets involve accessing the "wye" center tap; rewinding the ampere turn maximized coils so they span a single pole; and using a three-phase drive setup.

Full details appear in a superb *John Rees* video.

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Use Modern Drivers

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For maximum speed and the most tail twisting, you'll need a *current* drive or a *pulse modulated* drive. With provisions for lower holding currents that minimize heat losses between actual motions.

These days, a full dedicated microcomputer makes more sense than a stepper driver chip. Among other reasons, the dedicated micro is cheaper and easier to debug.

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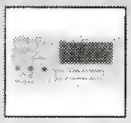
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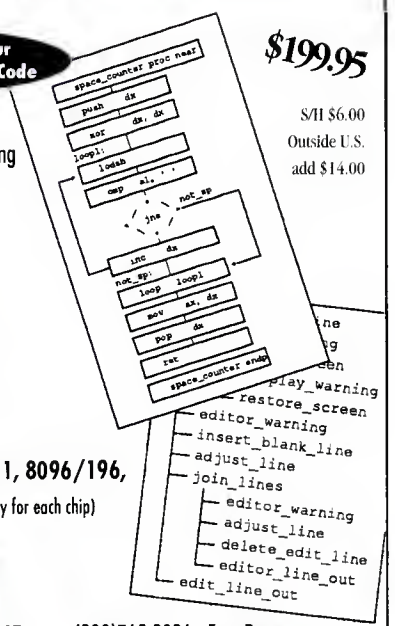

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new *Power+Arrays* series from *Texas Instruments* are ultra simple and cheap. In particular, do check out their three channel TIPC2301 for car alternator drives.

Pick a Two-brainer

The secret insider trick for flutterwumper intelligence is to split your problem in half. *Use only the simplest and scungiest brain-dead dedicated micro for only those unique custom tasks that are absolutely essental.* Do everything else using a stock computer or a PostScript printer.

On the brain-dead end, those PIC series micros from *Microchip Technology* make the most sense. Because these totally blow away anything from Intel or Motorola. They cost as little as two bucks each. Fine low cost development support is also offered. Especially the *Basic Stamp* from *Parallax*, and the *PIC Design Tools* from *Scott Edwards*. Scott also offers a $25 *stamp extender* that can easily be reprogrammed to do your *entire* flutterwumper.

You have your smart and big generic computer talk to your little and dedicated one by using some sort of meta language. While either HPGL or *Gerber* standards could be used, these may conflict with your $99 cost goal.

Instead, I feel that an ultra simple meta language using the absolute minimum of single character ASCII codes makes the most sense. Say N, E, S, W, U, D, and H for instance. Sent over a higher speed stock RS232 serial channel. Later on, after your costs are under control, you can add such features as vector motions, repeats, speedup, back-channel feedback, and comments.

Let the big computer do the co-ordinate transformations. Let the little one use raw native motions.

Regardless of your choice of a meta language, *make positively certain it is open and fully documented.* And is freely available to anyone at *zero* cost.

What about your smart computer? The big one that does all the work. For that, we'll send...

PostScript to the Rescue

The general purpose *PostScript* computer language offers compellingly strong advantages for flutterwumpers. PostScript easily handles graceful curves, fancy fonts, tool path compensation, and microsizing. Exotic co-ordinate transforms are trivial. The majority of the most powerful graphic design tools in the world use PostScript. Others are easily convertible.

Besides, PostScript can be available *free*. And is simple and fun to use.

There are three possible routes here. By a *crossporting* technique, you can simply use a laser printer as a general purpose PostScript computer, writing your meta language commands out a suitable port. Your flutterwumper then becomes a laser printer peripheral.

Or, you use a PostScript laser printer to write a meta language file *back* to your host for recording. From there, you'll stash the file in a disk library or resend it at your convenience. Using ordinary serial comm.

Finally, there is a shareware version of PostScript called *GhostScript* that can run on most any host. GhostScript is available for the downloading from PSRT and many other on-line sources. Be sure to get 3.0 or higher. Since the full sourcecode is *included* with GhostScript, you can easily customize it any way you like.

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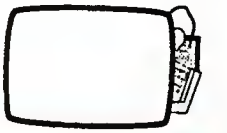

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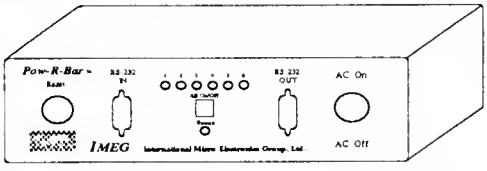

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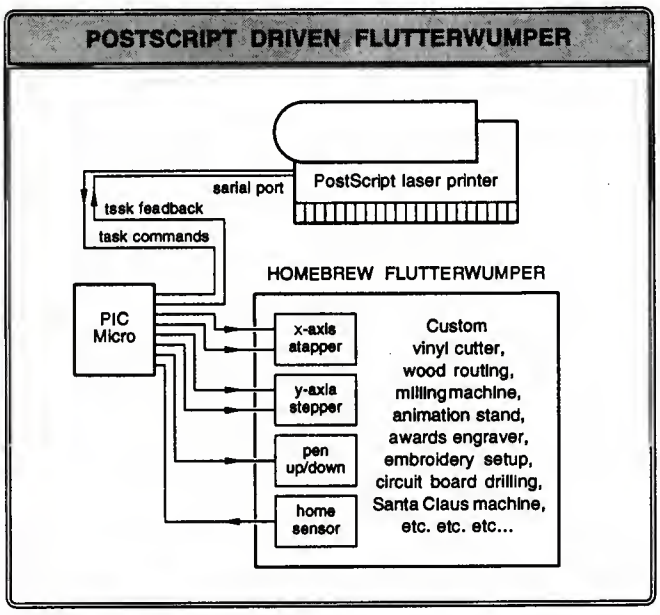
Automated XYTable

Here's one approach to a...



Any reasonable line art you can draw on paper can be sent to your flutterwumper. You first persistently download a special header to your PostScript printer, and then accept routine and *unmodified* artwork. The header intercepts the usual *showpage* and other commands and works some magic instead.

Being a general purpose computer language, PostScript easily outputs to your meta language, transforming on the fly. PostScript generates *paths*. Either directly or through use of the *pathforall* operator. The paths can be converted to vector steps with the *flattenpath* operator. From here, a few lines of code will convert to your meta language in the desired flutterwumper resolution.

Full details in POSTVECT.PS and FLUTUTIL.PS.

For More Help

Our resource sidebar gathers up several names and numbers needed for serious flutterwumper work. Besides those I've already mentioned, *Small Parts* is a great source for bits and pieces, while useful bigger lumps are offered by *Grainger* and *MSC Specialties*.

Genie's PSRT RoundTable has lots more on PostScript and flutterwumping topics. I've managed to wrangle a ten free hour trial deal just for you *Midnight Engineering* readers. Per the details below. ✦

Microcomputer pioneer and guru Don Lancaster is the author of 32 books and countless articles. Don maintains a no-charge technical helpline you'll find at (602) 428-4073, besides offering all his own books, reprints, and various services. Don has a free new catalog crammed full of his latest insider secrets waiting for you. The best calling times are 8-5 weekdays, Mountain Standard Time.

Don is also the sysop of GEnie PSRT where a special area has been set aside for all you Midnight Engineering readers. For modem access, dial (800) 638-8369. Then enter HHH followed by JOINGENIE. When prompted for a keyword, you enter DMD524. Or you could reach Don at Synergetics, Box 809, Thatcher, AZ 85552.

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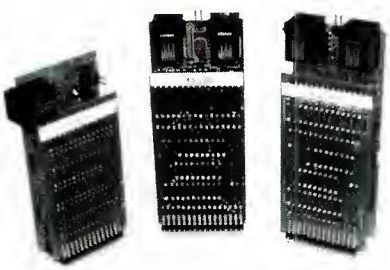

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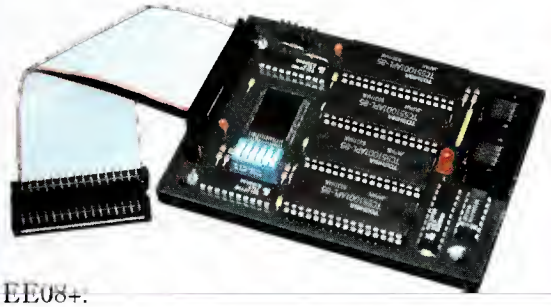

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Reader Service Number 75

CD-ROM Authoring

by Jim Stone

Entrepreneurial CD-ROM authors are creating handsome incomes in the budding frontier of the CD-ROM business. Envisioning and producing a marketable CD-ROM is not a trivial task. However, producing a CD-ROM often can be easier than convincing a publisher to help "co-produce" the package. Just finding a reputable publisher who has quality distribution channels to distribute your project can be difficult. This article is an overview of CD-ROM publishing from a publisher's perspective. My goal is to help prepare a potential CD-ROM author for an initial meeting with a publisher.

We at Third Planet Publishing create and develop CD-ROMs. Some projects we do from scratch, other projects we re-package. Like many publishing firms, Third Planet also performs services for authors such as artwork, pressing, marketing, and distribution. What many entrepreneurial authors may not quite understand is what goes through the publisher's mind when he is being presented with a potential project and the many phases of discussions that go on during the first meeting.

The creative development and research process of CD-ROM publishing is interesting. I always have a great time listening to all the ideas that potential authors have for CD-ROMS. The creative phase of a face to face meeting after a non-disclosure agreement has been signed (more on non-disclosures later) usually is exhilarating. Batting ideas back and forth, trading what ifs and inventing a new feature or two along the way. It's an intellectual turn on that can really get the adrenalin flowing. Unfortunately, somewhere along the line logic has to surface and you may discover, for a number of reasons that we can go into later, that the project — the author's baby — might not be, well ... beautiful.

The scenario of how a potential author and Third Planet Publishing gets together usually is via referrals from our friends and associates in the CD-ROM distribution industry. We like to think it's because we aren't the typical starched shirt publishing types and many entrepreneurs aren't either. During the initial phone call from someone who feels they have a viable intellectual property that could be turned into a CD-ROM, we try to ask a few qualifying questions about the subject and the presenter's background and credentials. We always make it very clear that we are only asking vague questions about the subject matter at that point. We don't want to know exact specifics yet because we are not under a mutual non-disclosure form. Authors should be wary of any publisher

who is trying to pry detailed information about your project without a non disclosure agreement.

Also beware of anyone who offers anything that sounds too good to be true. It probably is! Like that's a piece of Confucius wisdom to an entrepreneur, eh?. If the potential project sounds like a good CD-ROM opportunity, we try to set a time where the author and our creative staff can get together, sign a non-disclosure, and go over the project in as informal setting as possible. Depending on what time of day one shows up, we might even throw something on the grill and get down to business.

The meetings usually take about two to three hours to fully understand the scope of the project and begin to get a fair estimate of production costs. We also try to determine what portion of involvement Third Planet Publishing wants to have with the project (more on the levels of involvement latter). But, there are times when meeting in person is impossible at our office. In that case we try to have meetings scheduled around trade shows we may be attending, or as a last resort, doing the non-disclosure by fax and have a meeting via phone.

After we sign a non-disclosure we can get into the "Blue Sky" dream discussion phase that I fawned so favorably over earlier and begin to disclose specifics. Like all good things that come to an end, so must the revered Blue Sky session. This is where the discussion switches into logic mode. There is a large potential of points to be scored with a publisher during this phase of the meeting.

If the project we are discussing is a project that has been in development I expect to see a flow chart or a logic diagram of some sort. If the author says "what?" or if they don't have one, (and the project has been in the works) red lights and rockets start going off in the publishers mind. I've seen flow charts that were so elaborate (cross searching parameters especially) that they consisted of several pages. But, if the project is still in the discussion and formulation stage, an author probably won't have a chart. Bottom line: If you believe you have a good grasp on how the project will function, take the time to write a high level, easy to read profile.

If you do X then Y outline, then distill it down to a schematic. A flow chart not only helps you visualize your product but also helps you to see extra features that can be easily added. Flow charts are extremely helpful down the road when someone has a "bright idea" and walks up to the programmer and utters in a cheerful tone (yet a bit couched), "how difficult would it be if...." A good flow chart is almost always appreciated by a publisher. It shows attention to detail and adds to the level of commitment that is assigned by the author.

After a publisher gets a good idea of the author's potential for logical development of content on the project, the focus changes to demographics. After all, to make any money off these shiny pieces of plastic you have to be able to sell enough of them. Has the author given that question any attention? Score more points again by researching and preparing:

1) A definite and clear demographic target (it is surprising how many times when we ask "who will buy this CD-ROM?" we hear "Everybody!"). It just looks and sounds good to hear "18-34 year-olds with an expendable income potential between X and Y and here is the source from which the estimate is based on."

2) The suggested retail price that the author believes this product could be sold for.

3) Actual "street price" the disc would sell for.

4) Price to a distributor or reseller.

5) Number of units to be initially pressed.

6) A sample of the project if applicable or an estimate of time to finished product if the idea is not finished or in a conceptual form.

7) Any sales data that may be available from a similar product. There is nothing wrong with refining an existing idea ("build a better mousetrap..." etc.), just don't re-invent the wheel if you don't have to!

If all of the above information is present and appears to be valid, a good stab at developing an accurate estimate of potential sales can be made. I use a very simple formula: (Target Demographic size) * (Percentage of Computers in US households) * (Percentage of CD-ROM Drives per Household) * (A Pessimistic Safety Factor of 1-2 Percent). Remember Einstein didn't develop this formula, I did. So, it's just a rough estimate at best but it gives us a starting point.

The cost to develop this project up to the point where the disc is ready to be pressed may or may not be of interest to the publisher. It certainly will be of interest if both parties are going to co-develop the disc, but it is not too important if the author is going "solo" with the production. Of course, if the author is going solo a publisher may still inquire about the development cost. The answer that they receive is a good reality check. Whatever the reply, the publisher can tell a lot. Between the lines of the dollar cost of development is information about how clear the author is on the scope of the project?

Now the meeting has made it right up to the "Donner Pass" phase. If the answers to the above questions are still, well, questionable, then it would be rare for a publisher to invest any

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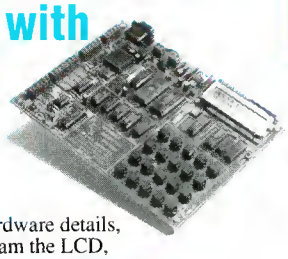

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Entrepreneurial Authoring

more time discussing the project. No two deals are alike, but most deals have similar elements. Many financial parameters hinge on the level of involvement (amount of work done) by both parties. A complete mastering, pressing, and distribution deal for a new title is very costly. What Third Planet considers a complete Disc Distribution deal is:

- **Mastering**
- **Disc art**
- **Packaging**
- **Package art**
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- **Printing**
- **Pressing**
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```
                mov     ax,2517h
                mov     dx,offset int_17h_entry
                int     21h             ; DOS Services  ah=function 25h
                                        ;  set intrpt vector al to ds:dx
                                        ;  ('Halt when ? printed.')
                mov     dx,offset data_4
                mov     ah,9
                int     21h             ; DOS Services  ah=function 09h
                                        ;  display char string at ds:dx
                mov     dx,19h
                mov     ah,31h
                int     21h             ; DOS Services  ah=function 31h
                                        ;  terminate and stay resident
                                        ;  al=return code,dx=paragraphs
virustst        endp
;
;               External Entry Point
;
int_17h_entry   proc    far
                pushf                   ; Push flags
                cmp     al,3Fh          ; '?'
```

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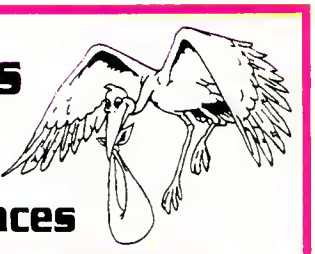
COM 80486 Device Drivers 80386 EXE 80286 Windows VxDs 80186 Binary Files 80x87 BIOS 8088 TSRs

It should be apparent that a substantial financial commitment is made each time a publisher decides to take on a new project. Third Planet has a direct relationship with MAXMEDIA Distributing (dba Mr.CD-ROM) for all sales and marketing concerns which permits Third Planet Publishing to distribute in 38 countries and garner sales in national chain outlets. It is very costly for an individual to self-finance a complete distribution package. Heck, it's not cheap for a publisher to finance a complete distribution package either for that matter. The cost of distribution is one of those areas that heavily influences the split on revenue of product sales that some refer to as royalties.

Because no two deals are exactly alike, let's assume that the publisher is interested in doing a full distribution deal. Once the sales potential has been estimated and levels of involvement (effort and financially) have been established, the exact financial terms of the deal begin to get discussed.

The most frequent demands made by an aspiring author is "I want X thousand dollars against royalties!," ("and I want....."). Cash against royalties, that's an interesting one. Where did that come from? Unless you've got a signed deal from Elvis or Ghandi...well, maybe not the king but you get the picture. Multimedia authoring software is becoming available almost at every level (much like the spread of AutoCad software in the 1980s). Quality material to be published is just not that hard to come by. Someone once asked for fifty thousand dollars advance to do a single unknown comic strip. Well that's nice if you can get it, but it became very apparent

BitBangers



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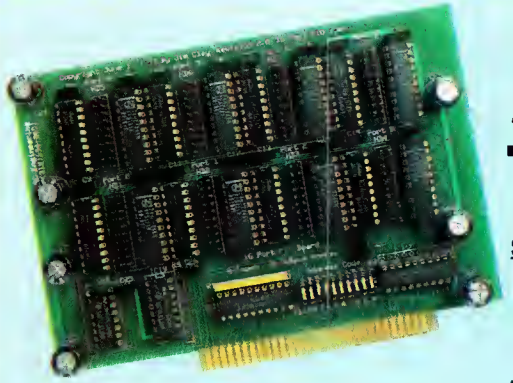

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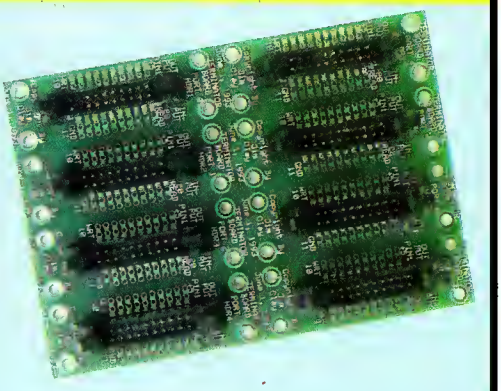

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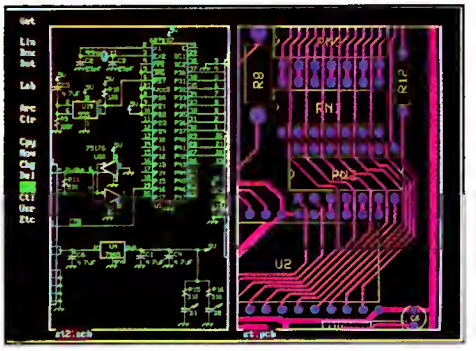

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Wild Ideas in Laser Printing!

Reader Service Number 73

that what they were really asking for was the money to be used as start up capital. Publishers simply aren't in the venture capital business. As good as our distribution is, we firmly believe we can sell ten thousand plus pieces of almost anything. It would be smarter to do 2.5 projects on subject material the likes of the television episode on Seinfeld (where Kramer wrote the book about coffee tables for coffee tables) before committing fifty thousand dollars cash up front for a no name comic strip and then having to finance a complete distribution package too!

The actual amount of money to be made in multimedia as an industry is staggering. But, on individual projects (unless of course you have the next Myst or Rebel Assault), it's pretty much like any other industry that requires timing, creativity, foresight, skill, hard work, long hours, luck, and of course a good lawyer. You will get a nice return, but don't plan on getting rich and retiring real soon. Your lawyer might, but not you.

A unknown author approaching a huge publisher and trying to get a complete package distribution deal can be pretty shocked to hear the small percentage points that are paid out. I am reluctant to talk in specifics about percentages because every deal is different. There are so many variables that have to be factored:

Was there cash up front?

What level of involvement both in effort and financially was there from both parties?

Will there be any charge backs against advertising (Co-op funds for a major ad campaign)?

Other rights involved etc.

Lets just say that the size of a big publishing/distribution firm doesn't always directly correlate to the size of percentages offered on a deal. Often the correlation is inversely related to the firm's size.

Seriously, the advance against royalty scenario should not be that attractive to an author. It merely serves as a buy-down in regards to the percentage paid on the back end of the deal. If the author believes in the project then they should believe that it will sell strongly enough to make a considerably higher amount via a nice royalty rather than a payment up front and a meager royalty. After all, if a publisher liked a project enough to pay substantial funds up front (when the project isn't even in a tangible form yet) then they may as well just buy the project outright.

On the other hand. if the author has a completed project that has had poor or limited success then it could be attractive for the author to just sell the project to the publisher outright. Not having to offer money up front (of course unless Elvis does walk in holding a master in a jewel case), a publisher usually feels that there is much more of a commitment to finish the project if there is a "partnership" agreement on the deal.

Another profit center that we can get into at another time is ancillaries. Nearly every product has the opportunity for these. For example, you used to be able to go to concerts for 8 dollars and someone thought up the idea to sell T-shirts. Now it just

makes sense that you should be able to get more than $8 for a T-shirt so lets charge $15 for the shirt and $25 for the ticket. An $8 ticket to a concert dates me, but developing new ancillaries — nearly every product is ripe for them — turns me on. I'd love to be able to talk openly about some of the logic modules that can be used to add additional sales potential, but remember our friend the non-disclosure? Besides a gentleman never tells!

Actually new technology is really fun to develop for CD-ROMs and in another follow-on article I would like to go into areas (hardware and software) that I think could use some "Midnight Engineering." There could be successful tie-ins to the home and consumer markets.

It seems to me that just about everyone could be a potential CD-ROM author at some point. I'm always open to phone calls about CD-ROMs and any distribution questions you may have.

ME

Jim Stone heads the Creative Development and Research department for Third Planet Publishing and can be reached via 407-877-3807 or fax 407-877-3834.

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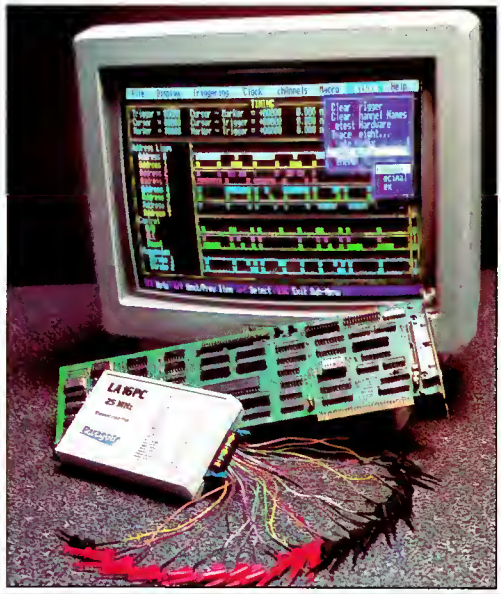

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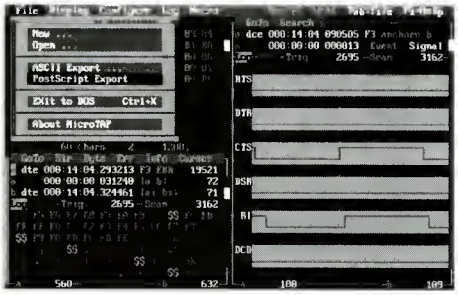

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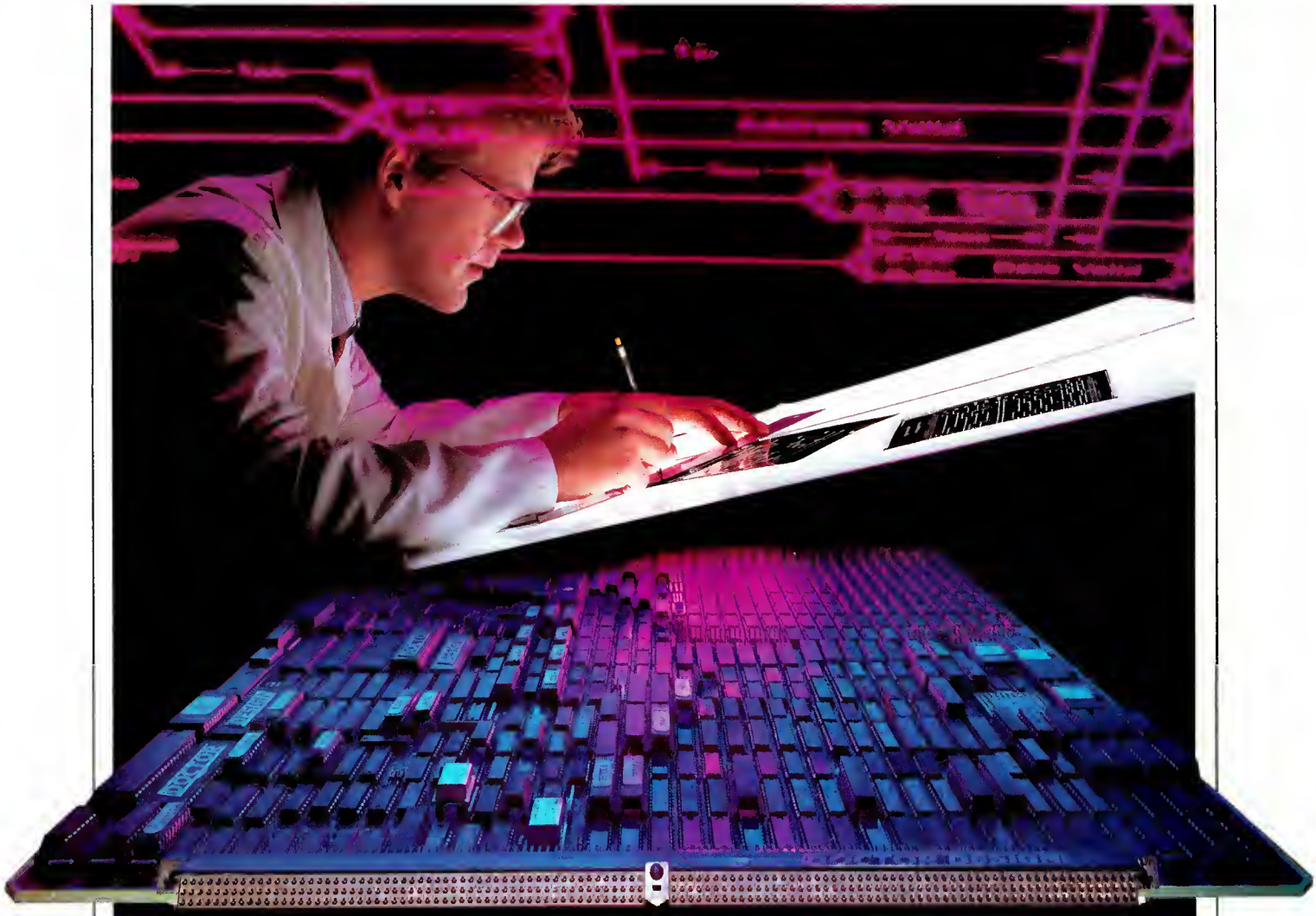

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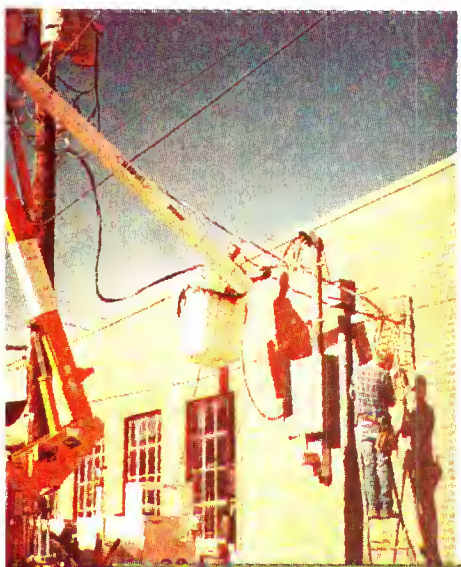
RFPC — 3

by William E. Gates

Recently, *The Wall Street Journal* (October 24, 1994 issue) had an article that provides some real support for many of the individual productivity issues I have been harping on. It was tagged "Back to the Past" and the headline read "Some Plants Tear Out Long Assembly Lines, Switch to Craft Work." The punchline for the article was "Firms in Japan and U.S. Say Output Rises if Workers Can set Their Own Pace."

Basically, they showed evidence from companies in the US and Japan that were getting 40% and higher gains in productivity by having workers do more than one job. In other words, my notion that humans respond to more challenge and less interference is being vindicated. It doesn't mean that everyone has to work alone like I do, but it does point out that most industries have been organized around the linear assembly line and have been operating very inefficiently. In fact, many jack-of-all-trades workers were pointing out that they could do much more if people would just get out of their way.

There are some industries, like the finish assembly of automobiles, that were cited as cases where this sort of craft working had not worked out well. From what the WSJ reported, I think most of these cases were not tried with any real creativity and certainly not with the type of people I think would be the best performers at this type of work. There are people out there who can do many tasks and most of those people can do diverse and overlapping tasks very efficiently. It is too bad that many times these high productivity tests are done with the idea of retraining the same workers that handled only one job on a traditional assembly line.



What I found most interesting about the WSJ article was what they are calling "spider assembly lines." In other words, many firms are building hybrids with some traditional in-line assembly (mostly using robotics), coupled with craft centers where people handle complex work and exceptions very well. The upshot of all this is that spiders can come together 10x faster and at 1/10th the cost compared to traditional assembly lines.

Part of what is driving this new force in productivity is the faster product life cycles of today and the demand for customization by the consumer. The consumer wants low-cost mass-produced products, but they want it to fit their needs or whims. Much of this variability can be handled by a unique person at a unique point in the assembly process.

I'll have much more to say about this from my perspective after I get my printing plant up and running. But, in the meantime, I would like to hear from you readers about any personal high productivity situations that you dream up or come across. And now for our bi-monthly update on the Rocky Ford Printing Company ...

The Hydraulic Hacker

Hydraulic lines going to various cylinders with lever controls that channel high pressure oil from a single pump — this is fluid computing in essense. All I really need is up/down and tilt/untilt. Basic forklift operations seem so binary until you ask how much up or how much weight can it lift up. Then suddenly the game is analog, but it's analog with some severe cutoff safety limits.

Forklift hydraulics at the limit is my current game. I could go out

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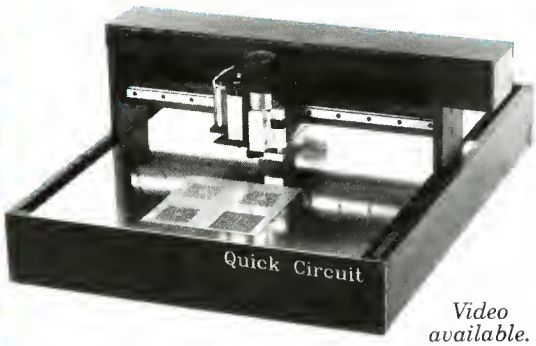

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Hydraulic Hacker

and spend $25,000 for a 25,000 pound forklift, but that would be more than I spent on the entire 4-unit web printing press that I'm trying to move around and set up. The individual press pieces vary from 10,000 to 13,000 pounds. The biggest forklift that I can rent (10,000 lbs comes from 60 miles away) would cost almost $1,000 a week (including transportation).

The picture shows my armada of three hackable forklifts that I have obtained through various auctions and trades. The smallest (#1) is a gas powered 4,000 lb indoor model that is a joy to use and fits most of my needs. The next larger one (#2) is a propane powered 6,000 lb indoor model. The largest one (#3) is an outdoor gas powered unrated towable model with a 30-foot high lift capability and 4 speeds in both the forward and reverse directions. Of course, none of these are capable of the job at hand, but all three will serve me well for a variety uses over the years to come. Forklift #3 is particularly useful for outside painting on my two-story house or trimming the very tall trees surrounding the house.

My first thought was to modify forklift #3. It weighs nearly 10,000 lbs with its six-cylinder engine and huge rear weight. There is a two-stage lift setup where one vertical hydraulic cylinder lifts for the first 5 feet until it limits and pressure is diverted to the second cylinder for the balance of the lift.

My hacker sense told me that if I could get both cyclinders to lift at the same time, I would get twice the lift capacity. One lever-valve and a single pressure hose operates both cylinders, but somehow the two cylinders sense a pressure differential that keeps the second cylinder from moving until the first has

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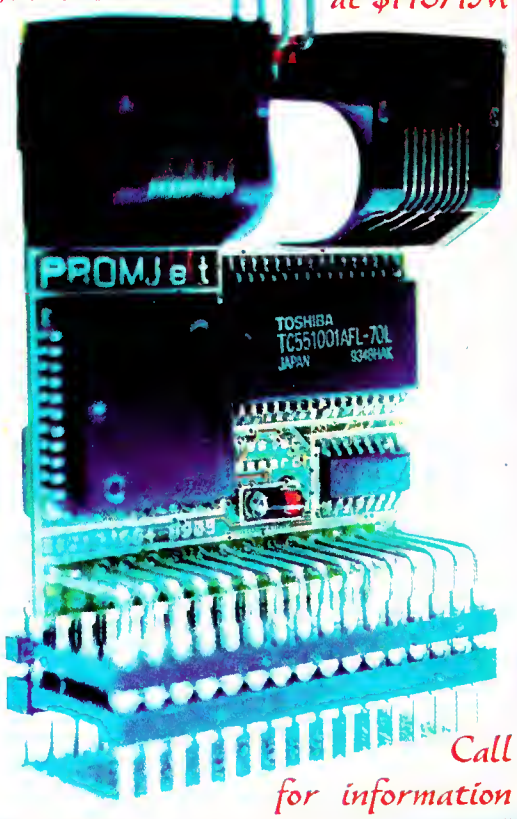

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reached its limit. And, when both are extended, the second one comes down fully before the first starts to descend. I talked to several local hydraulic gurus and even called some forklift service outfits in Denver, but nobody could tell me how this feat is accomplished with one hydraulic line.

My logic told me that if the same pressure reached both cylinders at the same time, they both would lift (the second cylinder would think that the first had limited). I inserted a special hydraulic pressure divider at the point where the hydraulic line went through a "Y" to both cylinders. Sure enough, both cylinders went up at the same time. It sounds crazy, but when I released the lever, the pressure drained from the second cylinder (making it move downward) to the first (making it rise). There wasn't any appreciable lifting capacity increase either, despite the fact that two cylinders were pushing up at once. Most likely, the cylinders need rebuilding in order to get them up to the proper lift capacity.

So much for the first hydraulic hacker attempt. I need to do more research into hydraulics to figure this out.. I'll do that when I have more time, but right now this heavy stuff needs to be moved around.

Weekend Rigger

In a catalog of professional rigging equipment, I found a set of four nifty little roller dollies that are designed around a dozen roller bearings connected in a chain configuration. Each dolly supports 5,000 pounds for a total capacity of 20,000 lbs. Now all I need to do is lift up one side at a time of each heavy piece and place the dollies under each corner. Then I simply push the heavy object around with the forklift of my choice.

The indoor forklifts, with their solid rubber tires, work better inside on concrete (they are worthless outside in the dirt). I selected forklift #2 (6,000 lb lift capacity) for this operation. I had a platform welded on the back end where we piled 2,000 lbs worth of tractor weights. It appears that this combination will now lift about 8,000 lbs. The modified forklift #2, with the dollies, is capable

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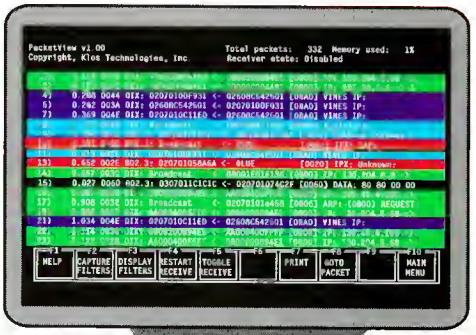

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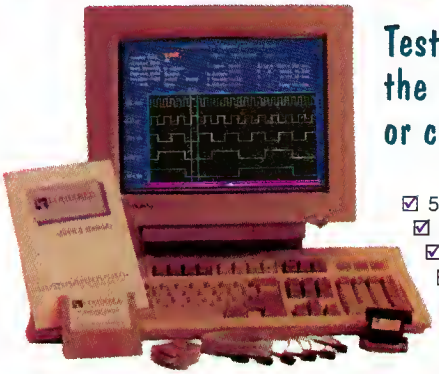

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of moving everything into place. When I get the hydraulic education I need, I can add some extra cylinders to get this forklift up to maybe 12,000 lbs capacity.

A Matter of Power

The building is wired for 3-phase 100 amp power, which definitely won't be enough for the printing plant. So, I had the local power company bring in 400 amps. I lucked out because they changed out the transformers on the outside pole as a maintenance upgrade, so my outside electrical upgrade didn't cost anything. It was a different story inside.

You wouldn't beleive it, but just to bring the 400 amps inside cost nearly $3,000. A 400 amp power box costs over $1,000 and the three 400 amp fuses cost almost $100 apiece. You don't find these items on the shelf of your local Builders Emporium! Maybe I can actually print something soon.

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Austin Code Works	51	44	Needham's Electronics	95	26
AZ-Tech	41	39	New Micros	85	C3
Berkeley Designs	75	68	Nohau Corp	56	58
Binary Technology	131	51	Nuts & Volts	Card	
Binary Technology	112	51	O'Brock Windmills	116	58
Binary Technology	107	51	OHB	109	59
Bit Bangers	14	71	Paladin Software	70	73
BlackLightning	73	72	Parallax		C4
Blinkinc	33	9	PCBoards	60	17
Blue Earth Research	101	3	Post	132	60
CadSoft Computer Inc	105	4	Prairie Digital	139	63
Capital Electro-Circuits	81	58	PseudoCorp		58
Capital Electronics	12	27	Quantasm Corp	49	64
Cascade Electronics	23	31	R.E. Smith	130	53
Cimetrics	97	31	SC Engineering	72	71
Coactive	9	60	Smithy Co	91	58
Communica, Inc	30	28	Software Factory	127	73
DATA I/O	84	41	Software Innovations	135	59
Dataman Programmers	93	25	Software Interphase	34	6
Data Track Systems	115	20	Software Interphase	144	7
DataTrace Inc	137	60	Software Interphase	140	11
DemoSource	104	22	Software Science	22	60
Doctor Database	54	34	Southwind Intl, Inc	43	59
Doctor Design	24	74	Star Byte	126	38
Duckworth Cons.	143	46	Symmetry Group	138	21
Duckworth Cons	79	54	Synergetics	61	62
DP Directory	32	59	Synergetics	106	63
DynaSem	6	60	Systronix	118	13
EE Computer Systems	116	58	TAL Enterprises	108	14
Elite Software	148	18	Tech Tools	71	67
Emac	145	45	Tech Pubs Indexes		58
Emulation Technology	42	73	Technical Marketing	55	59
ENTCON '95	99	C2	Techno-Isel	74	66
Express Circuits	27	48	Tera Tech	134	41
Genesis Engineering	15	54	Tern Inc	82	60
Grammar Engine	29	16	Time Line Inc	123	65
HiTech Equipment Corp	125	35	TRI-L Data Systems	31	47
ImageNation Corp	129	30	Trilogy Design	5	50
IMEG Ltd	136	66	T-Tech	103	76
Information Modes	50	17	Tucker Electronics	86	60
Iota Systems	111	39	Universal Cross Asm	13	58
Kios Technologies Inc	25	77	USTEK	44	59
Knull	58	58	V Communications		70
LDG Electronics	17	78	Visual Software Solution	10	55
Legend Communications	19	19	WesTec	133	76
Link Computer Graphics	142	24	Willies' Comp. Software	88	32
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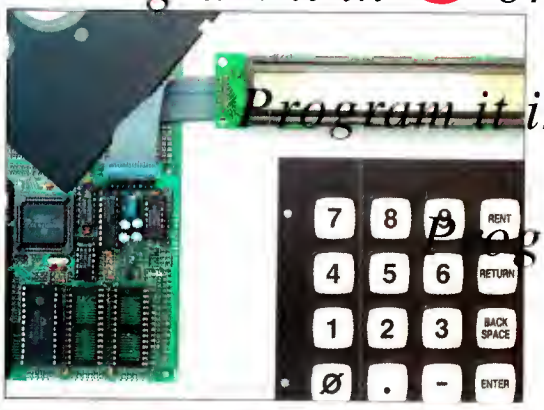
Lord Technical Services	124	27	Z-World	40	55

68HC11 Controller & Languages

Program it in **C** *or*



Program it in **Basic** *or*

Program it in **FORTH** *or*

Program it in **Assembly**

$99

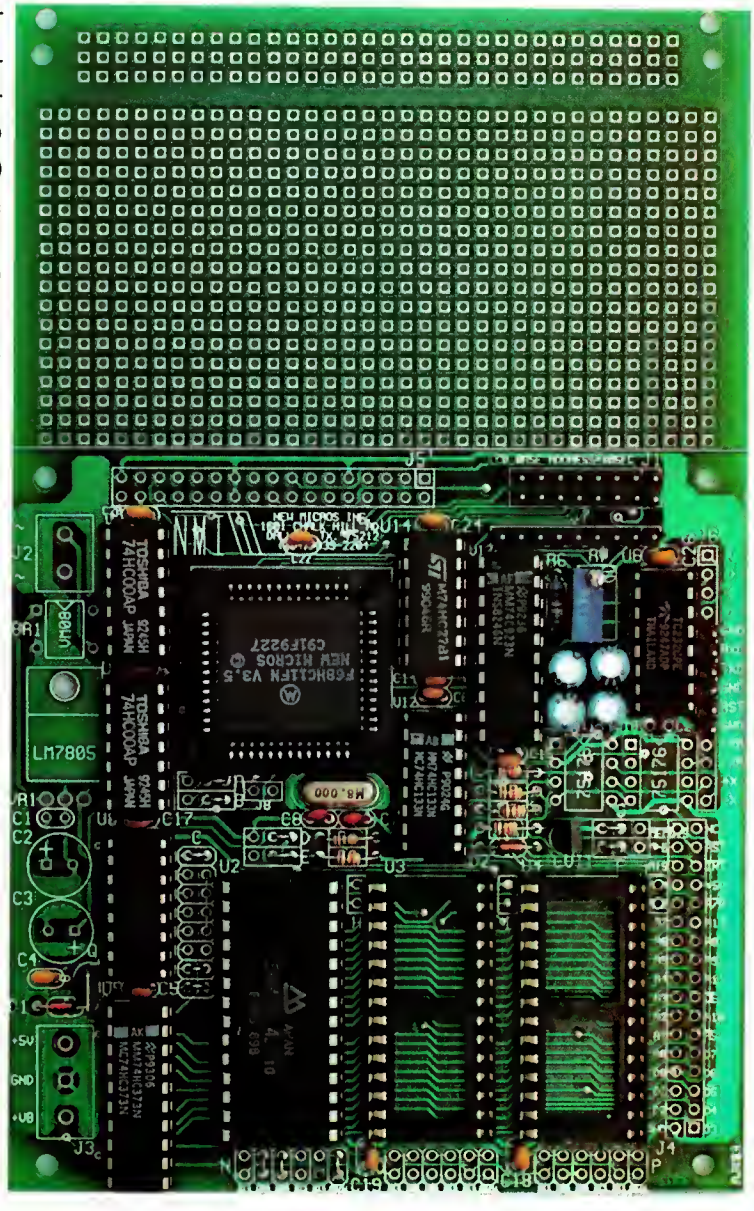
Low Cost Development Package: Controller + Languages + Manuals on disk included!

Package Price Breakthrough!

The NMIT-0020 Single Board Computer is perfect for dedicated controller with convenient interfaces for LCD displays and keypad. Intelligent LCD's up to 2 lines by 80 characters and matrix keypads up to 4x5 can be used. The processor is the popular F68HC11 with many features, including SCI and SPI serial channels, 8-bit 8-ch. A/D, 20 available I/O lines, Watch Dog Timer, 1/2K EEPROM and Max-FORTH w/Floating Point Package embedded in 12K internal ROM. SBC expands F68HC11 providing 3 28-pin JEDEC sockets for 8-32K RAMs, ROMs, EPROMs, EEPROMs, etc. RS-232 conversion supplied. Requires external regulated supply: 5V at ~30 mA. Based on NMIX-0020 board, so many features may be added as desired by the user (or by factory - call for details & prices).

Languages supplied on accessory disk: Small C, Basic, and Assembler. FORTH resident on chip (may be disabled). Languages come with manuals on disk. Communications utility, MAXTALK included to allow PC clone to act as terminal for download and development. WIPE utility included allows internal ROM, EEPROM, WDT to be enabled/disabled, and EEPROM to be erased. Manuals on disk: UM-MAX Max-FORTH Users Manual, HM-20 NMIX-0020 Hardware Manual, Small C manuals with examples, BASIC11E9 Manual.

SBC and utility disk - $99. Keypad and LCD not included. Great value. Call today! New Micros, Inc. 214-339-2204



NEW MICROS, INC.
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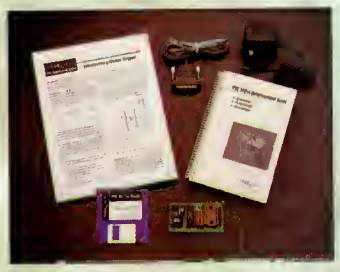
Reader Service Number 85

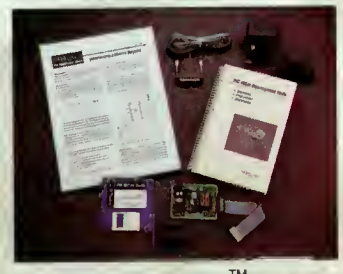
PIC®16Cxx MICROCONTROLLERS and TOOLS

In price and availability, nothing compares to PICs.



PIC16Cxx Programmer **$199**

Supports PIC16C5x, '71, & '84. Also PIC16C64 with 40-pin adapter.



TrueFlight for '71/'84 ™ **$299**

Programmer & flash UV eraser form development system for '71 & '84.

Impression '5x ™ **$399**

Downloader allows you to run PIC16C5x code in-circuit at 20 MHz.

ClearView 'xx ™ **$799***

Provides 20-MHz debugging for PIC16Cxx devices ('64, '71, '84,...).

PICs are the answer to many small controller needs, especially if price is an issue. A typical PIC is the PIC16C54-RC/P; it's an 18-pin DIP package with 12 I/O lines, 512 words of PROM, and 32 bytes of RAM, all for around $4.00 in small quantities. And newer PICs have interrupts, A/D, and up to 33 I/O lines.

For the past three years, we've been helping people get started with PICs. We offer a growing line of development tools, documentation, application notes, and technical help, as well as the PICs themselves.

If you'd like information on our PIC tools, or you'd like our complete catalog, please let us know. We'll be happy to send whatever materials you need.

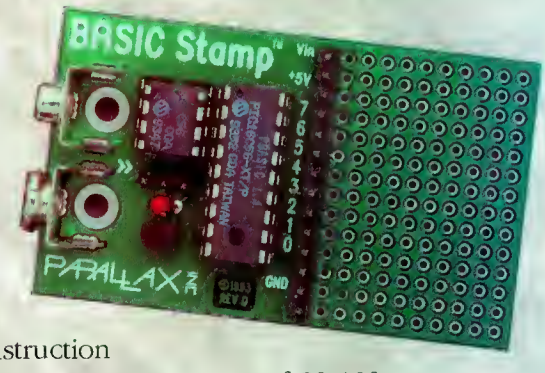
C Compiler **$795**

C compiler from Byte Craft supports PIC16Cxx and 17Cxx devices.

** Includes base unit price of $699, plus average PIC module price of $100.*

BASIC STAMP™

Stamp-Sized Computer Runs BASIC



The BASIC Stamp is a small single-board computer that runs BASIC programs. It has 8 I/O lines, which can be used for a variety of digital and analog purposes. The Stamp's BASIC language includes familiar instructions, such as GOTO, FOR...NEXT, and IF...THEN, as well as SBC instructions, such as SERIN, PWM, and BUTTON. Each instruction takes 2-3 bytes of the Stamp's 256-byte EEPROM, resulting in a maximum program size of 80-100 instructions. Programs execute at about 2,000 instructions per second.

The BASIC Stamp Programming Package contains everything you need to program Stamps using your PC. The package includes our editor software, programming cable, manual, application notes, and free technical support. **The package is available for $99; Stamps are sold separately for $39.**

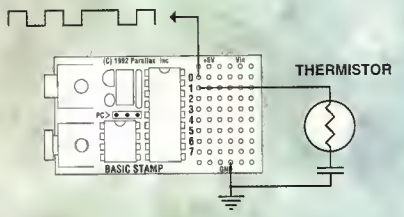
NEW

New Stamp Module Available Soon

A number of customers have expressed interest in a SIP-type Stamp for use in their products. So, we designed the "BS1-IC" depicted above (actual size). The BS1-IC has the same functions as the original Stamp, but without the prototype area and battery clips. We should have production units in November, depending upon availability of surface-mount parts. **Pricing will start at $29.**

Serial Temperature Sensor

Here, the Stamp uses the POT instruction to read a thermistor. The reading is linearized and then sent out serially.



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